ASSESSMENT OF POTENTIALLY SIGNIFICANT INDIGENOUS VEGETATION AND HABITATS IN GORE DISTRICT

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Report No. 2716

Prepared for:

GORE DISTRICT COUNCIL
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EXECUTIVE SUMMARY

As part of Gore District Council's Growth Study, a review of indigenous vegetation, habitats, and indigenous fauna was undertaken within the district. Potential sites of ecological importance were identified and mapped, and existing information on ecological features, values, and threats was collated. Ecological significance criteria have been developed which incorporate recent national policy.

Gore District comprises *c.*125,158 ha within the Southland Region and incorporates parts of six ecological districts (EDs): Gore ED, Hokonui ED, Southland Plains ED, Tahakopa ED, Umbrella ED, and Waipahi ED. Gore District contains predominantly highly modified vegetation and habitats. However, a total of 169 potentially important ecological sites were identified, with most occurring in Gore ED and Waipahi ED, although the largest sites were in Hokonui ED. There are more than twice as many unprotected sites than protected sites, with no protected sites in Tahakopa ED and only 5% of sites protected in Waipahi ED. Gore ED and Hokonui ED have roughly equal numbers of protected and unprotected sites, while in Southland Plains ED and Umbrella ED, 25-50% of sites remain unprotected. Seventy-five percent of sites are located on land environments classified as Acutely Threatened or Chronically Threatened.

In Gore District, important sites include the Mataura River and its margins, including habitat for threatened black-billed gulls, indigenous forest on the eastern margins of the Hokonui Range, oxbow lakes of the Mataura River and Waikaka Stream, and farm ponds and old workings ponds that provide waterfowl habitat. Indigenous forest, scrub, and grassland on the Waterfall Range northwest of Gore township include high value areas such as Croydon Bush and habitats for threatened and uncommon plants, reptiles, and invertebrates, and there are also red tussock/wire rush bogs at Pukerau and scattered throughout lowland areas elsewhere. The Dongwha MDF plant restoration plantings are also important because they are the only known area of indigenous forest on the alluvial plain landform in Gore District. Other important habitats include red tussock grassland on hillslopes, silver beech forest remnants and grey scrub in gullies on the foothills of the Black Umbrella Range, indigenous forest and scrub remnants on south-facing hillslopes of the Southland Syncline and alongside major waterways, and a swamp on the Waiarikiki Stream that contains flaxland.

Indigenous habitats within Gore District are threatened by drainage and nutrient enrichment (wetlands), vegetation clearance, lack of buffering, small size, pest plants, pest animals, land use change/ intensification, grazing, poor representation of particular habitat types, lack of knowledge of the values and importance of indigenous biodiversity, and lack of information on the extent of remaining biodiversity within the district.

Constraints to development are identified. Protected areas with high indigenous values (e.g. QEII covenants, the Mataura River, Croydon Bush, and Pukerau Red Tussock Reserve) and high value habitats on the Waterfall Range that lie outside protected areas but have similar values to and/or buffer significant sites are likely to preclude development. Other high value areas that are likely to constrain development include: wetlands - especially remaining red tussock fens, marshes, and swamps; indigenous forest - which is greatly reduced from its former extent; and waterways and their margins that provide habitat for important aquatic species such as inanga and Gollum galaxias, and support wetlands, or act as an important corridor or link between other habitats.

The policy framework for protection of indigenous biodiversity within Gore District includes the Transitional Regional Plan for Southland (1991), the Southland Regional Policy Statement (1997), the New Zealand Biodiversity Strategy (2000), the Resource Management Act (1991), the National Priorities for Protection of Indigenous Biodiversity on Private Land (2007), Regional Water Plan for Southland (2010), and the Proposed National Policy Statement on Indigenous Biodiversity (2011). Currently, the Gore District Plan does not contain a schedule of significant sites or ecological significance criteria, or general rules relating to indigenous vegetation and habitats. Policies and rules for the protection of wetlands within the district are particularly lacking. The focus of the plan is to protect existing values rather than to improve biodiversity values within the district. In addition, protection of existing values is reliant on non-regulatory methods, which may not be sufficient given the continuing threats to indigenous vegetation and habitats.

Although the focus should remain on protection of existing vegetation and habitats for indigenous species, there is enormous potential to improve ecological values within Gore District. This can be achieved through mitigating and offsetting adverse effects that cannot be avoided, undertaking indigenous plantings using naturally occurring locally-sourced indigenous species, undertaking control of pest plants and animals, fencing, legal protection, and establishment of ecological linkages between remaining areas of indigenous vegetation, establishment of indigenous riparian vegetation to promote connectivity and enhance freshwater habitat, and establishment of buffers around existing habitats. A combination of regulatory and non regulatory incentives could be used to support and encourage landowners to make appropriate land management decisions.

Current priorities are the field survey of potentially significant indigenous habitats, followed by ecological significance assessments. Clearer identification of sites containing significant indigenous vegetation and significant habitats of indigenous fauna would help to clarify those activities which require resource consent. Mapping of these areas for inclusion in the Gore District Plan along with more robust plan provisions would help to clarify the Council's approach to indigenous vegetation and habitats. High priority areas for ecological survey and assessment are Southland Plains ED and Gore ED (threatened by extractive industry), followed by Waipahi ED (few protected sites).

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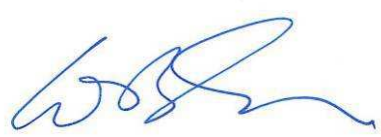
APPENDICES

PROJECT TEAM

Steve Rate - Report preparation.
Kelvin Lloyd - Report review.
Federico Mazzieri - GIS mapping and analysis.

Reviewed and approved for release by:



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W.B. Shaw
Director
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1. INTRODUCTION

Gore District Council (GDC) is currently undertaking studies to assess the impact of potential large-scale industrial development within Gore District (Gore District Growth Strategy). The primary aim of these studies is:

To identify, and provide a framework to manage, the effects arising from the construction and on-going operation of major primary and secondary industrial activities locating in the Gore District within the foreseeable future.

The Objectives include:

a. *Collation of baseline material that describes the current (2011) state, capacity and significance of the social, cultural, economic and physical environment (including landscape, ecology, infrastructure and transportation networks) of the district and surrounding areas within which effects can reasonably be expected to occur.*

b. *Where practical, to establish reliable statistical models to enable assessment of the effects of various scenarios, including those arising from possible developments and different spatial options for population growth as a consequence of those developments.*

c. *Identification of deficiencies in the existing physical infrastructure (roading, water, sewage, electricity, telecommunication) provided within the district and consideration as to how those deficiencies can be rectified.*

d. *Providing input into future work streams and actions to be undertaken, including a Growth Strategy for the district and changes to the Council's Long Term Plan and District Plan.*

e. *Identifying issues that require examination by Council in order to develop a robust strategy and policy framework in response to existing and future development and growth.*

This report addresses the ecological aspects of the Growth Strategy. The specific objectives of the ecological work stream are to:

(i) Review existing literature and databases on vegetation, habitats, indigenous fauna, and indigenous fisheries of the Gore District.

(ii) Undertake an overview GIS analysis using existing literature, databases and aerial photography.

(iii) Set out in general terms potential threats and degree of risk to sites of ecological importance in the district.

(iv) Having regard to relevant decisions of the Environment Court, develop criteria and a policy framework for assessing the importance of ecological sites within the District, and any effects on them from development.

(v) Identify and prioritise additional investigations and assessments that may be appropriate to ensure that Council has a contextual understanding of the matters in (i)-(iv) above.

2. METHODS

2.1 Review of existing information

Existing literature and databases on vegetation, habitats, indigenous fauna, and indigenous fisheries of the Gore District were reviewed. Sources of information included aerial photographs and Google Earth images, the New Zealand Freshwater Fish Database, Landcover Database Version 2 (LCDB2), Bioweb herpetofauna database, Ornithological Society of New Zealand (OSNZ) bird survey records, Environment Southland HVA reports, Protected Natural Area Programme survey reports for Southland Plains and Umbrella Ecological Districts, Threatened Environment Classification, a preliminary ecological evaluation of Gore District (Ernest New and Associates 1992), ecological information contained within a recent wildfire threat analysis (Southern Rural Fire Authority 2006), Sites of Special Wildlife Interest (SSWI), and other published and unpublished reports. Existing information and knowledge held by Wildland Consultants Ltd was also used to inform this analysis.

2.2 Collation of data

Data relating to important ecological sites and values was collated within an Excel spreadsheet and cross-referenced using site numbers and site names. Information fields within the spreadsheet include (where known) GPS coordinates, protection status, bioclimatic zone, ecological district, vegetation types, LENZ environments, indigenous LCDB2 cover classes, important fauna, important plant species, reason(s) for potential ecological significance, other important features, management issues, and an assessment of the reliability of the information provided. Structuring of information within a spreadsheet allowed analysis of the data by individual or multiple fields.

2.3 GIS mapping and analysis

Areas identified as having potentially significant ecological values were mapped onto recent aerial photographs. All sites were given a unique number and name, although a site may consist of more than one polygon. Shape files of the potential ecological values layer and attribute data for each polygon provides a basis for prioritisation of field surveys.

2.4 Threats to ecological values

When known, threats to ecological values at each site were listed and described. A coarse risk assessment of each threat was undertaken. Identified threats included weeds, pest animals, vegetation clearance, the presence of stock, and drainage of wetlands. Threats will generally need to be confirmed by field inspection.

2.5 Constraints to development

Areas with very high natural values or values were identified. It may not be possible to remedy or mitigate adverse effects on such values, which therefore have the potential to constrain future development activities within Gore District.

2.6 Ecological significance criteria

Criteria were developed to allow assessment of the ecological significance of areas containing natural values within Gore District. Criteria were based on criteria listed within the review of the Southland Regional Policy Statement and reflect recent Environment Court decisions on significance criteria and the Proposed National Policy Statement on Indigenous Biodiversity, but are also tailored to the particular representation and pattern of indigenous biodiversity remaining within Gore District.

2.7 Future work

Gaps in ecological information for the district were identified and recommendations provided as to additional work that may be desirable. Suggested work streams have been prioritised, with priorities relating to the potential significance of ecological values and to changes in land use that may affect those values.

3. PROJECT AREA

The primary Project Area consists of the land contained within the Gore District. Gore District comprises *c.*125,158 ha within the Southland Region (Figure 1). The eastern boundary of Gore District adjoins Clutha District in the Otago Region, while Southland District lies to the south and west. The population of Gore District is approximately 12,300 (projected - Statistics NZ) and the main urban centres are Gore and Mataura.

4. ECOLOGICAL CONTEXT

4.1 Ecological districts

An ecological district is a local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities. An ecological region comprises an aggregation of adjacent ecological districts with very closely related characteristics (Park *et al*. 1983 cited in McEwen 1987). Gore District comprises parts of five ecological regions (ERs) and six ecological districts (EDs): Waikaia ER (Umbrella ED), Gore ER (Gore ED), Catlins ER (Waipahi ED and Tahakopa ED), Southland Hills ER (Hokonui ED), and Makarewa ER (Southland Plains ED) (Figure 1). The characteristics of these ecological districts are described in more detail below.

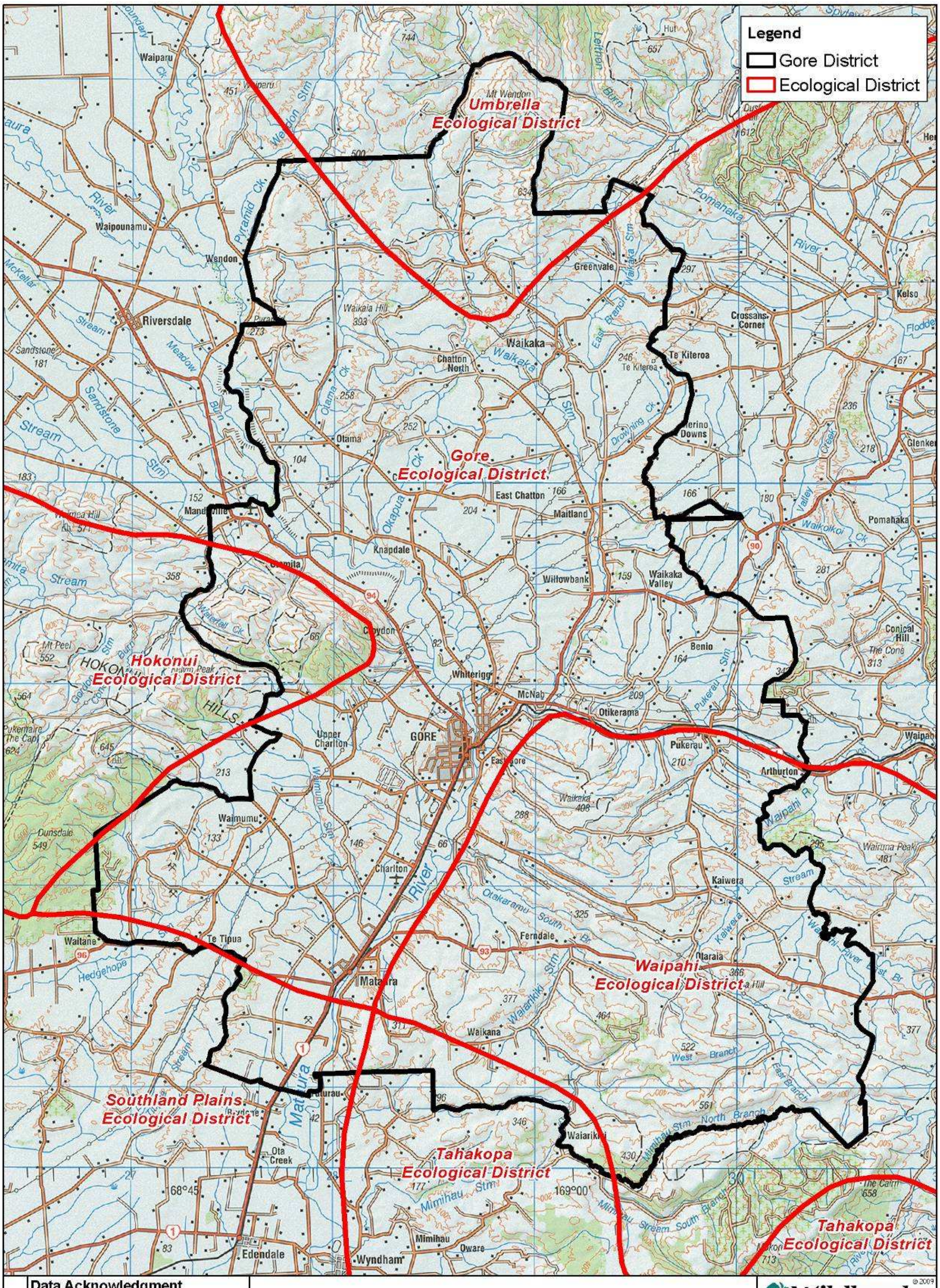

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Figure 1. Gore District and Ecological Districts

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4.1.1 Gore Ecological District

Proportion of Gore District in Gore ED: 55.37% (69,303.7 ha)
Proportion of Gore ED in Gore District: 23.32%

Gore ED (*c.*297,183 ha) covers the plains and low rolling country of inland Southland, extending from Mataura in the southwest almost to Raes Junction in the northeast, and from Mossburn in the northwest almost to Balclutha in the southeast. The central part of Gore ED is located in Gore District, and comprises the low elevation areas alongside the Mataura River and Waikaka Stream. The climate is humid-subhumid with dry summers and cold winters. Rainfall ranges from 650-950 mm p.a. (McEwen 1987).

Geology and Soils

Gore ED occupies part of the Southland syncline. Mesozoic (and Paleozoic in the east) sediments related to the syncline and underlie the northern slopes of the Hokonui Hills, and Tertiary and Quaternary sediments form the plains. Areas in the west and centre of the ED are flood plains of the major rivers with dissected loess-capped higher terraces underlain by Tertiary quartzose conglomerates, sandstone, mudstone, lignite and small areas of limestone, or Permian to Mesozoic greywacke. Mudstone and limestone in the east is largely mantled by loess or terrace gravel deposits (McEwen 1987).

On higher terraces and rolling land, soils have compact, pale coloured mottled subsoils and generally poor winter drainage. Soils in lower rainfall areas, on low terraces, and associated shallow and stony soils suffer from drought in dry summers. On river flats, there are fertile alluvial soils, some with poor drainage (gleyed). In higher rainfall hill country, there are limited areas of yellowish brown silty soils with good drainage (McEwen 1987).

Vegetation and Habitats

Pre-human vegetation in Gore ED would have comprised extensive forests on lowlands and hill slopes, and extensive wetlands on valley floors. Prior to European settlement, most of Gore ED would have been covered in red tussock grassland, with areas of narrow-leaved snow tussock-red tussock hybrids. There would also have been localised areas of podocarp and podocarp-hardwood forest (McEwen 1987). Today, due to vegetation clearance and modification for pastoral land uses, *c.*90% of the district comprises high producing exotic grassland (Landcover Database v2). Indigenous habitats persist in the form of small, modified red tussock grasslands on rolling low country and in areas with poor drainage, swamps, bogs, and short-tussock grasslands and matagouri in drier habitats. Indigenous forest, scrub, grassland, and freshwater wetland habitats each comprise <1% of land cover, and all indigenous habitats <3% land cover, within the ED (Landcover Database v2; Appendix 1).

4.1.2 Hokonui Ecological District

Proportion of Gore District in Hokonui ED: 3.51% (4,389.65 ha)
Proportion of Hokonui ED in Gore District: 6.58%

Hokonui ED (66,708 ha) extends west from near Gore township, and incorporates the rolling Hokonui Hills which reach 757 m a.s.l. The small portion of Hokonui ED within Gore District contains the Waterfall Range and Croydon Bush. The climate is cool temperate, and humid to sub-humid, with rainfall of 800-1,200 mm p.a. (McEwen 1987).

Geology, Topography, and Soils

Hokonui ED is part of the Southland Syncline of Mesozoic volcanic greywackes. On the rolling downlands in the east where there is moderate rainfall, soils are formed from deep to moderately deep loess that are moderately leached with pale-coloured compact subsoils and poor winter drainage. Some soils at higher altitudes are podzolised (McEwen 1987).

Vegetation and Habitats

The eastern parts of Hokonui ED would have been mostly covered in podocarp-hardwood and podocarp forest, with red tussockland in the northern and western uplands. Today, high producing exotic grassland comprises *c.*45% landcover, indigenous forest and scrub *c.*25% landcover, and indigenous tall tussock grasslands *c.*16% landcover within Hokonui ED (Landcover Database v2). Remaining forest in the east of Hokonui ED contains kahikatea, matai, rimu, miro, southern rata, totara, and kamahi. There are also remnants of red tussock grassland, short tussock grassland, mixed scrub, manuka, and narrow-leaved snow tussock grassland (McEwen 1987).

4.1.3 Southland Plains Ecological District

Proportion of Gore District in Southland Plains ED: 3.02% (3,777.05 ha)
Proportion of Southland Plains ED in Gore District: 1.42%

A small part of Gore District southwest of Mataura is located within Southland Plains ED (total area of ED *c.*266,445 ha). The ED has a moist, cool temperate climate, with cloudy and windy conditions. Rainfall ranges from 800-1,200 mm p.a. (McEwen 1987).

Geology, Topography, and Soils

This large district comprises most of the outer flat lowland Southland Plains and rolling downlands below 300 m a.s.l. Most of the ED is Quaternary sediments underlain by Tertiary sediments including extensive lignite deposits (McEwen 1987).

Soils in the lower rainfall areas in the north have poor drainage and compact subsoils with clayey textures. Soils on lower terraces are well drained, moderately deep over gravels. There are fertile silty to sandy alluvial soils on river flats, with drainage

ranging from good to poor (gleyed). Minor areas of peaty soils are present in swamps (McEwen 1987).

Vegetation and Habitats

Southland Plains ED would have originally contained more extensive forests and wetlands than are now present. Forests would have included lowland swamp forests of kahikatea, mixed podocarp forests on hillslopes, and riparian forests with kowhai and lowland ribbonwood. Today, landcover is dominated by high producing exotic grassland (*c.*89% landcover in the ED) due to conversion of land for farming. There are very few indigenous habitats remaining in the part of Southland Plains ED within Gore District, but small red tussock grasslands may persist.

4.1.4 Tahakopa Ecological District

Proportion of Gore District in Tahakopa ED: 2.24% (2,808.45 ha)
Proportion of Tahakopa ED in Gore District: 1.17%

Tahakopa ED (*c.*239,047 ha) is located to the south of Waipahi ED. Only a small part of Tahakopa ED is located within Gore District, incorporating the area from south of Mataura east towards Waiarikiki. The climate is moist, cool, and cloudy. Rainfall is from 800-1400 mm p.a. (McEwen 1987).

Geology, Topography, and Soils

Tahakopa ED is a coastal district of parallel low hills and valleys formed by folded Jurassic marine and estuarine sediments (sandstones and mudstones) of the Southland syncline. Most of Tahakopa ED is below 600m a.s.l. (McEwen 1987).

There are a range of soils from a variable cover of loess over tuffaceous greywacke and related slope deposits. At lower altitudes, soils are moderately leached with firm to friable silty or clayey subsoils. At higher altitudes under cooler, moister conditions, soils have a pale-coloured subsurface horizon and iron/humus pans. On higher crests of the ranges there are poorly drained soils with peaty topsoils. Small areas of alluvial soils are present in valleys (McEwen 1987).

Vegetation and Habitats

Tahakopa ED would have originally contained extensive low-altitude podocarp/kamahi forests. These have now been largely cleared for agriculture, with high producing exotic grassland today comprising *c.*55% landcover within the ED (Landcover Database v2). Remaining indigenous forests (*c.*33% cover) are mostly located at higher elevations outside Gore District.

4.1.5 Umbrella Ecological District

Proportion of Gore District in Umbrella ED: 7.31% (9,154.34 ha)
Proportion of Umbrella ED in Gore District: 6.20%

Umbrella ED (*c.* 147,765 ha) extends from just north of Waikaka in the south to just north of Roxburgh in the north, and from just north of Raes Junction in the east to just north of Edievale in the west. Only a small southern portion of Umbrella ED lies within Gore District. The climate is cool, temperate, and moist with an annual rainfall of 500-1500 mm (McEwen 1987).

Geology, Topography, and Soils

The geology of Umbrella ED mostly comprises Paleozoic Haast Schist which is metamorphosed to textural zone II (semi-schistosity or schisosity without foliation) in the southern part of the ED. Topography in the south of the ED is characterized by relatively homogenous low to moderate altitude foothills and dissected semi-schist plateaux. Drainage patterns are largely eroded into the pre-existing surface sediments and are unrelated to the underlying geological structures (Dickinson 1988).

Soils in the southern part of the district are yellow-brown earths intergrading with yellow-grey earths, often exhibiting a wide range of textures, being derived from varying combinations of loess, schist, and greywacke (Dickinson 1988).

Vegetation and Habitats

Prior to human settlement of New Zealand, forest would have been more widespread in Umbrella ED. After the arrival of Polynesians, there was an increase in the frequency of fires. Forests were largely replaced by tall tussock grasslands with small remnants restricted to fire refuges. European settlement resulted in vegetation clearance, grazing, and the introduction of exotic plant species (Dickinson 1988). Present-day vegetation consists mostly of high producing exotic grassland (*c.*35% of total land cover in the ED), low producing grassland (*c.*30% of cover), and tall tussock grassland (*c.*20% of cover) (Landcover Database v2). Indigenous beech (*Nothofagus* spp.) forest covers *c.*8.7%, and indigenous scrub *c.*2.4%, of the ED. In the part of Umbrella ED within Gore District, indigenous vegetation and habitats are likely to comprise modified red tussock wetlands, lowland tussockland, small remnant stands of silver beech, and remnants of lowland mixed shrubland.

4.1.6 Waipahi Ecological District

Proportion of Gore District in Waipahi ED: 28.54% (35,725.08 ha)
Proportion of Waipahi ED in Gore District: 38.36%

Waipahi ED (*c.*93,123 ha) extends from the Mataura River south of Gore township towards the east. The climate is moist cool, cloudy with rainfall of 800-1200 mm p.a. (McEwen 1987).

Geology, Topography, and Soils

Waipahi ED is characterised by a series of parallel hills and valleys formed by folded Jurassic marine and estuarine sediments (sandstones and mudstones) of the Southland Syncline (McEwen 1987). The part of the ED within Gore District is mostly below 500 m a.s.l., draining westwards to the Mataura River and eastwards to the Waipahi River.

Soils are well drained with a variable cover of loess over tuffaceous sandstones and related slope deposits. Subsoils are yellowish brown firm and clayey-textured with a blocky structure, mainly moderately leached, and moderately fertile. Higher altitude soils are more strongly leached with more friable subsoils, with highest elevation soils having poorly drained (gleyed) and peaty topsoils (McEwen 1987).

Vegetation and Habitats

Waipahi ED would originally have been almost entirely forested. The area within Gore District would have contained podocarp/kamahi forests. Early Polynesian fires would have replaced the forest with induced red tussock grasslands between *c.*1200 and 1800 AD (McEwen 1987). After European settlement, there was substantial vegetation clearance and modification as the land was converted for pastoral farming. Today, *c.*78% of the district comprises high producing exotic grassland, although a few heavily modified remnant tussock grasslands (*c.*7% of cover in the ED) and forest and scrub remnants (*c.*5.2% of cover) persist.

4.2 Protected Areas

Protected areas covering *c.*1,186 ha are present within Gore District. Most lie within Hokonui ED (867 ha) and Gore ED (270 ha). Land administered by the Department of Conservation (*c.*1,042 ha), includes 27 marginal strips (96 ha), Croydon Bush Scenic Reserve (873 ha), and Pukerau Red Tussock Reserve (12 ha). There are seven QEII Open Space Covenants but these total only a small area (*c.*28 ha).

4.3 Recommended Areas for Protection

Of the ecological districts in Gore District, Protected Natural Area Programme (PNAP) surveys have only been undertaken in Southland Plains ED and Umbrella ED. Neither PNAP report identified any Recommended Areas for Protection (RAP) within Gore District. This does not mean that there are no further habitats worth protecting in Gore District, but that the best examples of each habitat type recognised in those two PNAP reports were located outside Gore District.

4.4 Major rivers and streams

- Gore District is characterised by the Mataura River which flows from its north-western margins, around the eastern edge of the Hokonui Hills, and south past Gore and Mataura townships. The Mataura River is not classified as a water of national importance (Chadderton *et al*. 1996), due to its modified state. However, it provides habitat for threatened and uncommon species including black-billed gull (*Larus bulleri*), black-fronted tern (*Chlidonias albostriatus*), and several fish species. Water

Conservation (Mataura River) Order 1997 protects the Mataura River, Waikaia River and its tributaries, the Otamita Stream, all other tributaries of the Mataura River upstream of its confluence with the Otamita Stream, and the Mimihau Stream and the Mokoreta River and each of their tributaries for their "outstanding fisheries and angling amenity features". The order includes minimum flow rates, provisions relating to water permits, discharge permits, and regional plans, prohibitions on damming, and provisions relating to discharges.

The Mataura River reaches the coast at Toetoes Harbour, an estuarine system which forms part of the Awarua Plains Wetland Complex. This complex is known for its high ecological values including mudflats, sandflats, saltmarsh, extensive peatlands, ponds, cushion bog, shrublands, tussocklands, rushlands, podocarp forest, intact vegetation sequences, and invertebrate, bird, fish, and threatened species habitat (Cromarty and Scott 1996). Water quality and quantity reaching this complex is influenced by land activities and water uses in the Mataura River catchment (5, 360 km^2), including Gore District.

The Waikaka Stream and Waikaka Stream East Branch (tributaries of the Mataura River) are the major waterways extending into the northeast of Gore District. Originating in the foothills of the Black Umbrella Range, they are primarily located in an intensively farmed area. East of Gore township, numerous small streams flow westward into the Matuara River from gullies between strike ridges of the Southland syncline. Southeast of Gore township, two branches of the Waiarikiki Stream also flow to the Matuara River, while the Mimihau Stream North Branch forms part of the southern Gore District boundary. Southwest of Gore township many streams which originate in the Hokonui Hills flow south-eastward across flat to rolling land to the Mataura River.

A small south-eastern part of Gore District drains into the Clutha River catchment via the Kaiwera Stream, Waipahi River, and Pomahaka River. The Pomahaka River catchment is classified as a Type II water of national importance due to the presence of threatened fish species (Chadderton *et al*. 1996).

4.5 Threatened Land Environments

Threatened Land Environments (Walker *et al*. 2007) in Gore District are mapped in Figure 2. Appendix 2 provides a breakdown of each classification by ecological district. Most (72%) of Gore District is covered in Acutely Threatened Land Environments, which are the environments under greatest threat, having less than 10% of their original indigenous cover remaining. However, most land in Hokonui ED is classified as Underprotected (>30% indigenous cover remaining and 10–20% protected), with a relatively low area of Acutely Threatened Land Environments.

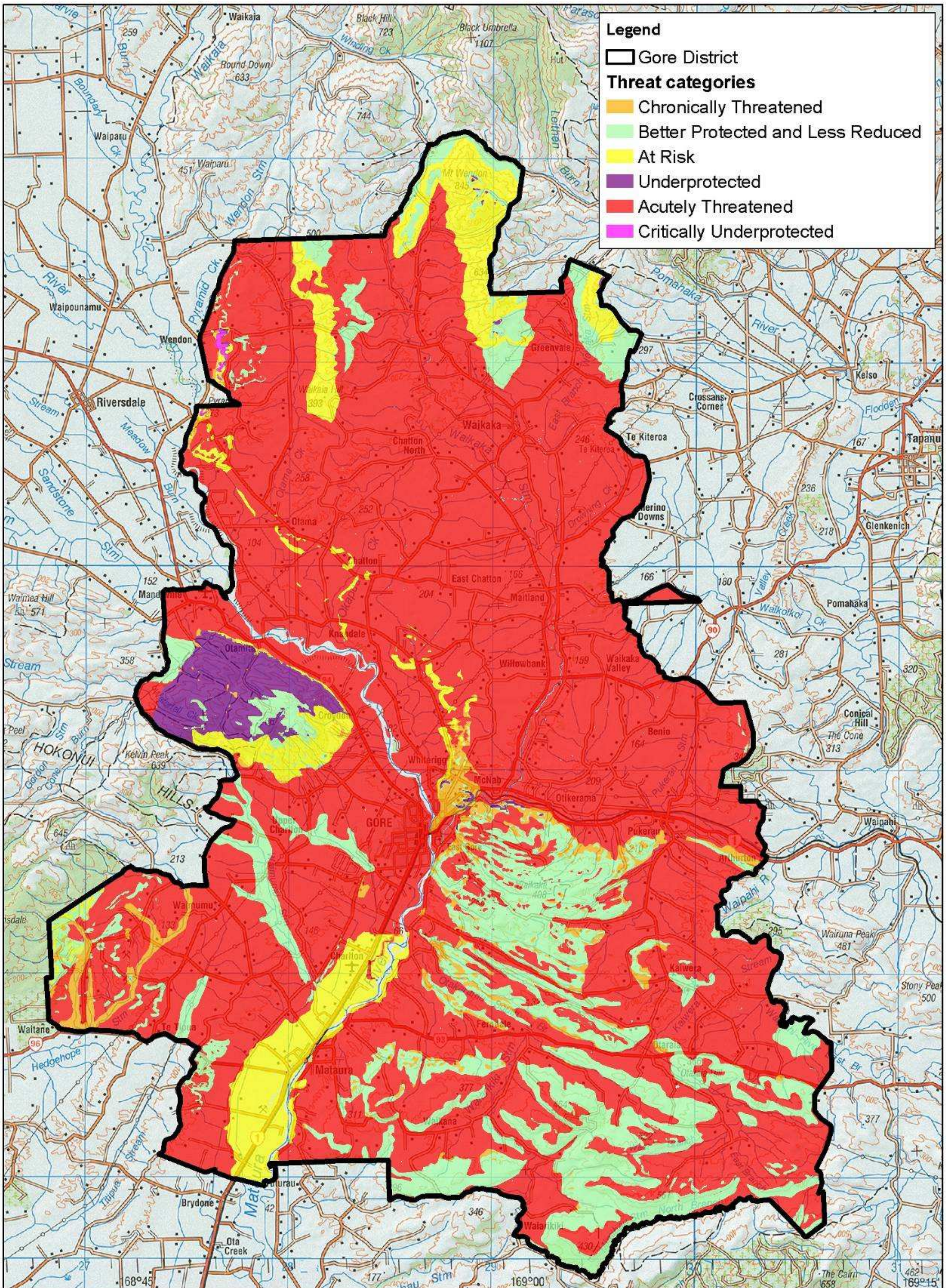

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Figure 2. Threatened Environment Classification for Gore District

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5. VEGETATION AND HABITATS

5.1 Podocarp forest and podocarp/broadleaved forest

Several podocarp, broadleaved, and podocarp/broadleaved forest types are present in Croydon Bush and Dolamore Park (Table 1).

Table 1: Podocarp/broadleaved forest types in Croydon Bush (from Allen *et al*. 1989).

Forest Type	Area (ha)	Landform	Dominant Species
Kahikatea forest	9.6	Valley floor	Kahikatea, miro, Halls totara, pokaka. over small trees of broadleaf, putaputaweta, kaikomako. Shrub layer: horopito, *Coprosma rotundifolia*, *Neomyrtus pedunculata*. Ground layer: *Gahnia procera*, *Astelia fragrans*.
Kamahi-matai-rimu forest	207	Hillslopes; moist, cool	Emergent matai, rimu. Canopy: kamahi. Shrub layer: *Neomyrtus pedunculata*, *Coprosma rotundifolia*, mapou, *Raukaua simplex*. Ground layer: crown fern.
Matai-mixed broadleaved forest	185.7	Hillslopes; dry, shallow, stony soil	Emergent matai, rimu, totara. Canopy: southern rata, broadleaf, tarata. Shrub layer: Mapou, *Coprosma linariifolia*, *C. foetidissima*, *C. rotundifolia*, horopito.
Halls totara-southern rata forest	48.8	Ridge crest above 300 m; dry skeletal soil	Canopy: southern rata with regenerating Halls totara, scattered broadleaf. Shrub layer: *Coprosma linariifolia*, mapou, horopito, *C. crassifolia*, *C.* sp. Ground layer: shield fern, hound's tongue fern, *Asplenium hookerianum*.
Totara-broadleaf forest	10.5	Hard porous rock with thin soil	Similar to Halls totara-southern rata forest
Mixed broadleaved forest	26.8	Hillslopes; moist, cool	Margins of Kamahi-matai-rimu forest. Canopy: large broadleaf amongst Halls totara, fuchsia, wineberry. putaputaweta, kohuhu, *Pseudopanax colensoi*, mapou, *Coprosma linariifolia*, horopito.

Near the eastern end of Weatherburn Road, southeast of Matuara, a linear forest remnant on a steep slope on the northern side of a gully contains broadleaved forest dominated by fuchsia (*Fuchsia excorticata*), pate (*Schefflera digitata*), elder (*Sambucus nigra*), mapou (*Myrine australis*), broadleaf (*Griselinia littoralis*), horopito (*Pseudowintera colorata*), and wineberry (*Aristotelia serrata*) with several emergent trees of matai (*Prumnopitys taxifolia*) and kahikatea (*Dacrycarpus dacrydioides*). Ferns were the dominant ground cover, reflecting the shady, moist microclimate of the site (Wildland Consultants 2005).

A podocarp/broadleaved forest remnant is present in a gully near Ironwood Bush Road on the district's southern boundary, east of the Mataura River. The remnant contains emergent matai, rimu (*Dacrydium cupressinum*) and kahikatea. The most common broadleaved species are mapou, elder, horopito, fuchsia, and broadleaf. The understorey was dry, with patchy fern cover, abundant tree nettle (*Urtica ferox*), and much bare ground (Wildland Consultants 2005).

5.2 Southern rata-kamahi forest

Forest dominated by southern rata (*Metrosideros umbellata*) and kamahi (*Weinmannia racemosa*) is present in Hokonui forest remnants (Site GDC 17) and Croydon Bush. In Croydon Bush the forest was described as a depauperate community with few other woody plants other than the dominant species (Allen *et al*. 1989). Southern rata/kamahi forest is also present in small forest remnants elsewhere in the district (e.g. Ironwood Bush Road; Wildland Consultants 2005).

5.3 Kowhai-ribbonwood forest

At the western end of the Weatherburn forest remnant (QEII covenant 5/13/109 and GDC 71), steep dry, rocky slopes support a small amount of kowhai, lowland ribbonwood, and *Olearia fragrantissima* (Wildland Consultants 2005). Forested riparian margins, such as those of the Mimihau Stream North Branch, are likely to be covered in kowhai-ribbonwood forest with scattered emergent matai, similar to vegetation found outside the district in the Mimihau Stream South Branch.

5.4 Silver beech forest

Silver beech (*Nothofagus menziesii*) forest is found in gullies near Mt Wendon, in the north of Gore District. The gullies are headwater tributaries of the Waikaka Stream and Waikaka Stream East Branch. A common associate species is putaputaweta (*Carpodetus serratus*) (Ernest New and Associates 1992).

5.5 Treelands

Kowhai treelands are present in pasture alongside tributaries of Hedgehope Stream (Ernest New and Associates 1992). A large treeland (Site GDC 114), consisting of remnant trees from a cleared area of Hokinui Forest, is present in farmland in the southwest of the district.

5.6 Scrub

Several types of scrub have been recorded in Gore District:

- Broadleaved scrub containing forest tree species as well as inaka (*Dracophyllum longifolium*) and mountain holly (*Olearia illicifolia*) (Croydon Bush; Allen *et al*. 1989).
- Coprosma-*Phormium cookianum* scrub, also with shield fern (*Polystichum vestitum*) (Croydon Bush; Allen *et al*. 1989).
- Tauhinu scrub (Croydon Bush; Allen *et al*. 1989).
- Fuchsia-lowland ribbonwood open hardwood scrub, also containing broadleaf (*Griselinia littoralis*), *Pittosporum* spp., kowhai (*Sophora microphylla*), narrow-leaved lacebark (*Hoheria angustifolia*), and kaikomako (*Pennantia corymbosa*) (Croydon Bush; Allen *et al*. 1989).
- Grey scrub (LCDB2) "Small-leaved *Coprosma* are usually dominant." (Thompson *et al*. 2003).

5.7 Shrubland

Shrublands, dominated by manuka (*Leptospermum scoparium*), kanuka (*Kunzea ericoides*), matagouri (*Discaria toumatou*), and coprosmas, are scattered across the district (Ernest New and Associates 1992). Manuka shrubland, with seedlings of broadleaved tree species, is present at Croydon Bush (Allen *et al*. 1989).

5.8 Flaxland

Only one large flax (harakeke; *Phormium tenax*) swamp (Site GDC 5) is known in Gore District. This swamp, alongside Waikana Road also contains scattered crack willow (*Salix fragilis*). Flaxland comprises *c.*0.01% land cover in Waipahi ED (Landcover Database v2).

5.9 Tall tussock grassland

Tall tussock grassland remnants are dominated by red tussock with scattered narrow-leaved snow tussock and hybrids on hillslopes or stream margins (Environment Southland 2010b). Tall tussock grassland vegetation on stream margins tends to occur in narrow, linear strips. Most remnants are grazed and contain exotic species. Examples on hillslopes include areas to the south of Pukerau (Site GDC 91) and to the north of Waiarikiki. (Sites GDC 53 and GDC 54). Several examples are present on the margins of tributaries of Hedgehope Stream in the southwest of the district.

5.10 Short tussock grassland

Hard tussock (*Festuca novae-zelandiae*) grassland with introduced species of grasses and herbs is present at Croydon Bush (Allen *et al*. 1989).

5.11 Raised bog peatlands

Raised bogs are a distinctive feature of valley floors in many parts of Southland Region. Vegetation comprises red tussock (*Chionochloa rubra*), wire rush (*Empodisma minus*), and *Sphagnum* over deep peat. Other species present include *Dracophyllum* spp., tangle fern (*Gleichenia dicarpa*), and *Baumea* spp. Today, these wetlands tend to be hydrologically isolated by modification of their catchments through drainage and agriculture (Agnew *et al*. 1993). Weeds present may include gorse (*Ulex europaeus*), broom (*Cytisus scoparius*), and silver birch (*Betula pendula*). A well-known, publicly visible example in Gore District is the Pukerau Red Tussock Reserve.

5.12 Fernland

Bracken (*Pteridium esculentum*) fernland, with seedlings of tree species is present at Croydon Bush (Allen *et al*. 1989). Site GDC 101 on the northeast slopes of Mt Wendon is likely to contain extensive bracken fernlands, and bracken will also likely be a significant component of regenerating forest margins at many sites.

5.13 Rivers, streams, and their margins

This type includes streams, rivers, and braided riverbeds. Most stream margins in the lowlands have been modified and are now dominated by exotic vegetation. Species present include pasture species, crack willow, monkey musk (*Mimulus guttatus*), and pondweeds (*Potamogeton* spp.) (Ernest New and Associates 1992). However, small gullies around Titipua Stream contain flax, tall sedges, and some indigenous shrubs. Near Miller Road in the southwest of the district, a tributary of Hedgehope Stream has scattered kowhai within pasture (Ernest New and Associates 1992). In the hill country, stream margins are also highly modified but may contain remnant shrublands, scrub, or forest.

5.14 Ponds and lakes

Ponds range from farm ponds (e.g. Site GDC 12 Willowbank Pond) to old gravel pits (e.g. Site GDC 11 Old Workings Pond) and old coal pits (e.g. Site GDC 25 McIlwraith pond). Vegetation often comprises willows and sedges. The only lakes in Gore District comprise several oxbows of the Mataura River and Waikaka Stream. Vegetation and habitats in oxbows comprise willows, flax, open water, and sedges (Ernest New and Associates 1992). Ponds and lakes provide important habitat for waterfowl and longfin eel (Zane Moss, Southland Fish & Game, pers. comm. August 2011).

6. THREATENED AND UNCOMMON INDIGENOUS PLANTS

Ernest New and Associates (1992) stated that there were "no records of rare or endangered plants in the District", but the Department of Conservation survey information for Croydon Bush Scenic Reserve contains records for fierce lancewood (*Pseudopanax ferox*) and fragrant tree daisy (*Olearia fragrantissima*) (Table 2). Fragrant tree daisy has also been recorded in small forest remnants elsewhere within the district (Wildland Consultants 2005). Raukawa (*Raukaua edgerleyi*) is highly palatable to browsing mammals and has become an uncommon species. Beech trees are hosts for threatened mistletoes, with *Alepis flavida* (At Risk-Declining) having been recorded in Umbrella ED (Dickinson 1988), although there are currently no records for this species in Gore District. There are very likely to be additional threatened and uncommon plant species within Gore District, which are likely to be discovered if field investigation of sites is undertaken by competent botanists who recognise the habitats and growth forms of these species.

Table 2: Threatened and uncommon plant taxa recorded in Gore District.

Species	Common Name	Threat Classification[1]/ Justification
Kelleria dieffenbachii[2]		Normally found at higher altitudes
Olearia fragrantissima	Fragrant tree daisy	At Risk-Declining
Pseudopanax ferox	Fierce lancewood	At Risk-Naturally Uncommon
Raukaua edgerleyi	Raukawa	Regionally uncommon

[1] From de Lange *et al*. (2009).
[2] Location uncertain, but in red tussock on Mataura-Clinton Road (Ernest New and Associates 1992).

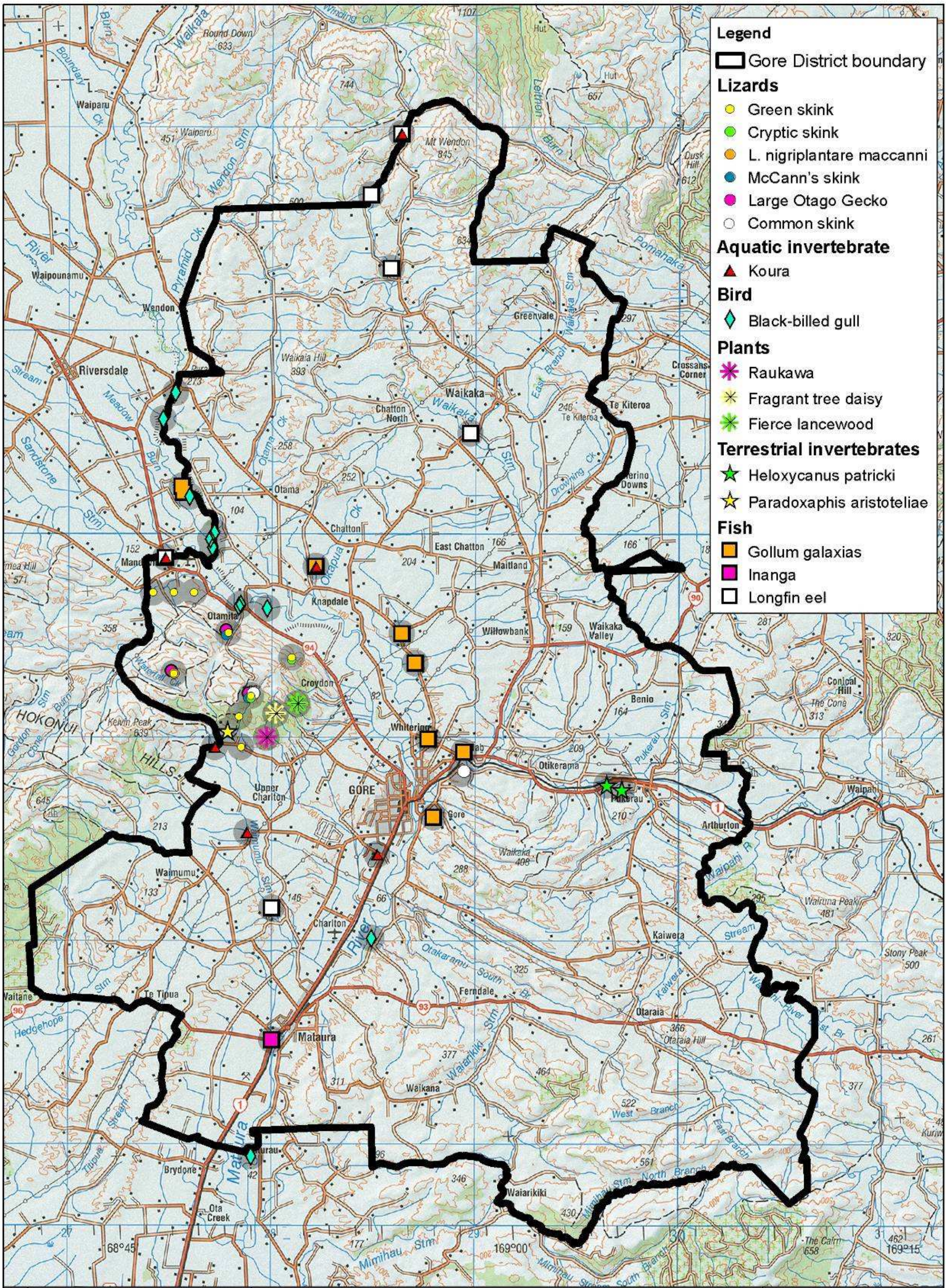
7. INDIGENOUS FAUNA

7.1 Avifauna

A total of 59 species of birds (40 indigenous, 19 exotic) have been recorded in Gore District (Ernest New and Associates 1992) or in 10 × 10 km grid squares overlaying Gore District (Robertson *et al*. 2007). Forest remnants provide habitat for common forest birds such as bellbird, tui, kereru (New Zealand pigeon), and fantail, while ponds and waterways provide habitat for common waterfowl such as grey teal, New Zealand shoveler, pukeko, and the exotic mallard (Ernest New and Associates 1992).

Several threatened and uncommon bird species utilise habitats within Gore District (Table 3). Black-fronted tern and banded dotterel are recorded regularly but in low numbers along the Mataura River within Gore District (Robertson *et al*. 2007). Several black-billed gull colonies have been recorded on the Mataura River within Gore District from 1996-1998 (data from Lloyd Esler), and in 2005 and 2006 (Rachel McClellan, Wildland Consultants, unpublished data). They are mostly located north of Otamita, with one colony south of Gore near Charlton (Figure 3). Estimated colony size ranged from 100 to 2000 birds. The locations of these colonies may have changed since these surveys were undertaken.

Of the remaining threatened and uncommon species, New Zealand pipit are found in indigenous grasslands, pied stilt and oystercatchers frequent pasture and riverbeds, rifleman inhabits forests, and shags utilise rivers and other waterways. Australasian bittern and South Island fernbird have been recorded recently in the grid square containing Croydon Bush (Robertson *et al*. 2007). New Zealand falcon are occasionally sighted in Gore District. Grey duck are occasionally recorded on rivers and ponds. There are infrequent records for many species, such as white heron, cattle egret, black-fronted dotterel, and Caspian tern, and Gore District is unlikely to provide important habitat for these species. There are no recent records for long-tailed cuckoo, marsh crake, yellow-crowned kakariki, or South Island robin, and these species may no longer be present within Gore District.



Data Acknowledgment

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Figure 3. Important fauna in Gore District

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Scale: 1:250,000
Date: 02/08/2011
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Table 3: Threatened and uncommon avifauna recorded in Gore District. References: 1. Ernest New and Associates (1992); 2. Robertson *et al*. (2007).

Species	Common Name	Threat Classification[1]	Reference
Acanthisita chloris chloris	South Island rifleman	At Risk-Declining	1; 2
Anas superciliosa superciliosa	Grey duck	Threatened-Nationally Critical	1; 2
Anthus novaeseelandiae novaeseelandiae	New Zealand pipit	At Risk-Declining	1; 2
Ardea modesta	White heron	Threatened-Nationally Critical	1
Botaurus poiciloptilus	Australasian bittern	Threatened-Nationally Endangered	1; 2
Bowdleria punctata punctata	South Island fernbird	At Risk-Declining	1; 2
Bubulcus ibis coromandus	Cattle egret	Indigenous-Migrant	1
Charadrius bicinctus bicinctus	Banded dotterel	Threatened-Nationally Vulnerable	1; 2
Charadrius melanops	Black-fronted dotterel	Indigenous-Coloniser	1
Chlidonias albostriatus	Black-fronted tern	Threatened-Nationally Endangered	1; 2
Cyanoramphus auriceps	Yellow-crowned kakariki	Not Threatened	1
Eudynamys taitensis	Long-tailed cuckoo	At Risk-Naturally Uncommon	1
Falco novaeseelandiae "eastern"	New Zealand falcon	Threatened-Nationally Vulnerable	1; 2
Haematopus finschi	New Zealand pied oystercatcher	At Risk-Declining	1; 2
Himantopus himantopus leucocephalus	Pied stilt	At Risk-Declining	1; 2
Hydroprogne caspia	Caspian tern	Threatened-Nationally Vulnerable	1
Larus bulleri	Black-billed gull	Threatened-Nationally Endangered	1; 2
Petroica australis australis	South Island robin	Not Threatened	1
Phalacrocorax carbo novaehollandiae	Black shag	At Risk-Naturally Uncommon	1; 2
Phalacrocorax melanoleucos brevirostris	Little shag	At Risk-Naturally Uncommon	1; 2
Porzana pusilla affinis	Marsh crake	At Risk-Relict	1

[1] From Miskelly *et al*. (2008).

7.2 Herpetofauna

Four indigenous lizard species and one exotic frog species have been recorded in Gore District (Table 4). Most records come from the Hokonui Hills, including Bushy Park, Croydon Bush, and Dolamore Park, but also from near Mandeville. Two lizard species are listed as 'At Risk-Declining' in Hitchmough *et al*. (2010). *Leiolopisma nigriplantare maccanni* has also been recorded in the district, but this taxon name is no longer valid and it could have been either McCann's skink or common skink. The record for this taxon is included in Figure 3.

Table 4: Herpetofauna recorded in Gore District (DOC Bioweb Database 2011; Reardon and Tocher 2003).

Species	Common Name	Threat Classification[1]
Woodworthia "Otago/Southland"	Large Otago Gecko	At Risk-Declining[2]
Oligosoma chloronoton	Green skink	At Risk-Declining
Oligosoma nigriplantare polychroma	Common skink	Not Threatened
Oligosoma maccanni	McCann's skink	Not Threatened
Litoria ewingii	Brown tree frog	Introduced and Naturalised

[1] From Hitchmough *et al*. (2010) and Newman *et al*. (2010).
[2] This classification is for the synonymous *Hoplodactylus* aff. *maculatus* 'Otago large'.

7.3 Aquatic fauna

There are records for nine species of fish and one invertebrate in the New Zealand Freshwater Fish Database (NZFFD; NIWA 2011) for Gore District (Table 5). Longfin eel (*Anguilla dieffenbachii*), Gollum galaxias (*Galaxias gollumoides*), and inanga (*Galaxias maculatus*) are listed as 'At Risk-Declining' in Allibone *et al*. (2010), while koura (*Paranephrops zelandicus*) is listed as 'Chronically Threatened-Gradual Decline' in Hitchmough *et al*. (2007). Location records for these species are mapped in Figure 3. Longfin eel, recorded throughout the District, is threatened nationally by damming of rivers (which limits migration), allee effects, and fishing pressure. Gollum galaxias is found in Southland and Stewart Island and threatened by water abstraction, poor water quality, and predation by trout. In Gore District this species has been recorded north and east of Gore in tributaries of the Mataura River and Pukerau Stream, and populations are also present just outside the district boundary north of Mandeville. Inanga, recorded only in Waimumu Stream, is threatened by continuing loss and degradation of habitat. Koura, recorded in the north and west of the district, is threatened by drainage of wetlands, loss of riparian vegetation (which increases turbidity and decreases the availability of food sources), pollution of waterways, illegal harvesting, and predation by introduced animals (DOC 2006). There are only records for lamprey (*Geotria australis*; At Risk-Declining) and torrentfish (*Cheimarrichthys fosteri*; At Risk-Declining) from just outside the District and they may also be present within Gore District. The previous record for giant kokopu (*Galaxias argenteus*; At Risk-Declining) in McEwen (1987) is not confirmed by the NZFFD, with the closest records for this species coming from just south of the district in Ota Creek, near Edendale.

Table 5: Notable aquatic fauna recorded in Gore District.

Species	Common Name	Threat Classification[1]
New Zealand Freshwater Fish Database (2011)		
Anguilla australis schmidtii	Shortfin eel	Not Threatened
Anguilla dieffenbachii	Longfin eel	At Risk-Declining
Galaxias gollumoides	Gollum galaxiis	At Risk-Declining
Galaxias maculatus	Inanga	At Risk-Declining
Gobiomorphus breviceps	Upland bully	Not Threatened
Gobiomorphus cotidianus	Common bully	Not Threatened
Paranephrops zelandicus	Koura	Chronically Threatened-Gradual Decline
*Perca fluviatilis**	Perch	Introduced and Naturalised
*Salmo trutta**	Brown trout	Introduced and Naturalised
Additional Species Listed in Ernest New and Associates (1992)		
Cheimarrichthys fosteri	Torrentfish	At Risk-Declining
Geotria australis	Lamprey	At Risk-Declining
*Salvelinus fontinalus**	Brook char	Introduced and Naturalised
*Oncorhynchus tshawytscha**	Chinook salmon	Introduced and Naturalised

[1] From Allibone *et al*. (2010).

7.4 Terrestrial invertebrates

Several important terrestrial invertebrates have been recorded in Gore District (Table 6). The aphid *Paradoxaphis aristoteliae* has only been recorded at two sites in New Zealand, being found repeatedly at Dolamore Park, but is no longer found at the other site. Its host plant is wineberry (*Aristotelia serrata*). Since 1993, *P. aristoteliae* has been observed regularly in Dolamore Park, but it was almost always restricted to one plant (Teulon and Stufkens 1998).

The sphagnum porina (*Heloxycanus patricki*) has been recorded at "Pukerau Bog". Despite being widespread in eastern areas of Otago/Southland, this species is uncommon or threatened at many sites (McGuinness 2001).

Aphis healyi (Acutely Threatened-Nationally Endangered) has been recorded on private land in the Hokonui Hills and may also be present within Gore District. Its host plants are *Carmichaelia* spp. (Teulon and Stufkens 1998).

Table 6: Important terrestrial invertebrates recorded in Gore District.

Species	Common Name	Threat Classification[1]
Heloxycanus patricki	Sphagnum porina	Chronically Threatened-Gradual Decline
Paradoxaphis aristoteliae	Aphid	Acutely Threatened-Nationally Critical

[1] From Hitchmough *et al*. (2007).

8. POTENTIALLY SIGNIFICANT SITES

8.1 Preliminary identification

Sites of potential ecological significance within Gore District were identified using existing information such as published reports and electronic databases, as well as

satellite imagery and aerial photographs. These methods have the following limitations:

- Not all potentially significant sites will be identified.
- Existing information may be old and out of date.
- Satellite imagery/aerial photographs may be of poor quality, making accurate identification of ecological values difficult.
- A desktop study will not obtain sufficient information to adequately assess many sites.
- Some of the sites identified will not be significant.

8.2 Summary of potentially significant sites

A total of 169 potentially significant sites have been identified, covering a total of 7,257.9 ha in Gore District (Table 7, Table 8, Appendix 3). Most sites (140) are in, or partly in, Gore ED and Waipahi ED. There are only six sites in, or partly in, Hokonui ED (including Croydon Bush Scenic Reserve and extensions, and Waterfall Range grasslands and shrublands), but they cover almost 50% of the total area covered by potentially significant sites (Table 7).

Table 7: Area (ha) covered by potentially significant sites in Gore District.

Ecological District	Area (ha)	% Area
Gore	1,412.1	19.5
Hokonui	3,598.4	49.6
Southland Plains	175.1	2.4
Tahakopa	109.2	1.5
Unbrella	566.6	7.8
Waipahi	1,396.6	19.2
Total	7,257.9	100.0

There are more than twice as many unprotected sites than protected sites, with no protected sites in Tahakopa ED and only 4% of sites protected in Waipahi ED. Gore ED has a similar number of protected and unprotected sites, but in Southland Plains ED and Umbrella ED 25-50% of sites remain unprotected (Table 8).

A total of 80 potentially significant sites (47% of all sites) are entirely or partly located on land environments classified as Acutely Threatened or Chronically Threatened. Most (81.3%) of this land is unprotected (Table 9). These sites will meet National Priority 2 (MfE & DOC 2007a; 2007b) if indigenous vegetation is present.

Two plantation forest sites have been included because they have been previously identified as important fauna habitat (Ernest New and Associates 1996): Downs Rd plantation (GDC 20) and Miller Rd plantation (GDC 120).

As the exact area of each black-billed gull colony has not been determined, colonies were given a nominal area of 0.03 ha and therefore make only a small contribution to the area of potentially significant sites in Gore ED.

Table 8: Protection status of potentially significant sites in Gore District.

Ecological Districts[1]	All Sites				Protected Sites				Unprotected Sites			
	No.	% No.	Area (ha)	% Area	No.	% No	Area (ha)	% Area	No.	% No.	Area (ha)	% Area
Gore	65	38.5	316.3	4.4	37	71.2	160.4	13.7	28	23.9	155.9	2.6
Gore/ Hokonui	4	2.4	4,168.5	57.4	1	1.9	872.7	74.6	3	2.6	3295.8	54.1
Gore/ Southland Plains[2]	6	3.6	514.8	7.1	1	1.9	N/A[1]	N/A[1]	5	4.3	514.8	8.5
Gore/ Umbrella	1	0.6	26.8	0.4	0	0.0	0	0.0	1	0.9	26.8	0.4
Gore/ Waipahi	5	3.0	44.9	0.6	1	1.9	12.6	1.1	4	3.4	32.3	0.5
Hokonui	2	1.2	95.4	1.3	2	3.8	95.4	8.2	0	0.0	0	0.0
Southland Plains	8	4.7	35.4	0.5	3	5.8	9.5	0.8	5	4.3	25.9	0.4
Southland Plains/ Tahakopa	1	0.6	11.2	0.2	0	0.0	0	0.0	1	0.9	11.2	0.2
Tahakopa	4	2.4	17.8	0.2	0	0.0	0	0.0	4	3.4	17.8	0.3
Tahakopa/ Waipahi	3	1.8	328.5	4.5	0	0.0	0	0.0	3	2.6	328.5	5.4
Umbrella	14	8.3	554.6	7.6	5	9.6	13.5	1.2	9	7.7	541.1	8.9
Waipahi[3]	56	33.1	1,143.7	15.8	2	3.8	5.3	0.5	54	46.2	1,138.4	18.7
Total	**169**	**100**	**7,257.9**	**100**	**52**	**100**	**1169.4**	**100**	**117**	**100**	**6,088.5**	**100**

[1] As indicated, several sites are located in more than one ecological district.
[2] The Mataura River (Site GDC 100) was not mapped.
[3] Excludes Site GDC 101, the exact location of which is unknown.

Table 9: Area (ha) and protection status of potentially significant sites with Acutely and Chronically Threatened Land Environments within Gore District.

Ecological District	Area (ha)	% Total Area	Area (ha) Unprotected	% Area Unprotected
Gore	359	34.2	246.1	28.8
Hokonui	101	9.6	42.5	5.0
Southland Plains	77.5	7.4	74.7	8.8
Tahakopa	52.4	5.0	52.4	6.1
Umbrella	58.9	5.6	45.5	5.3
Waipahi	400.0	38.1	391.9	45.9
Total	**1,048.8**	**100**	**853.1**	**100**

Summaries of potentially significant sites in each ecological district are set out below:

Gore Ecological District

- Riverbed and margins, including habitat for threatened black-billed gull.
- Indigenous forest and treeland on the eastern margins of the Hokonui Range (e.g. sites GDC 17 and GDC 114).
- Oxbow lakes of Mataura River and Waikaka Stream, farm ponds, and old workings ponds providing waterfowl habitat (e.g. QEII 5/13/107, GDC 6, GDC 13, GDC 22, and GDC 74).
- Red tussock fens at Pukerau and scattered throughout lowland areas (GDC F450058 GDC 15, and QEII 5/13/263)

Hokonui Ecological District

- Indigenous forest, scrub, and grassland on the Waterfall Range northwest of Gore township. Incorporates high value areas in Croydon Bush (site F450009), and habitats for threatened and uncommon plants, reptiles, and invertebrates.

Southland Plains Ecological District

- Small- to medium-sized ponds of potential significance, proving waterfowl habitat (e.g sites GDC 21, GDC 22 GDC 74, and GDC 77).
- Red tussock fens (e.g. sites GDC 31-GDC33).
- Dongwha Patinna MDF plant enhancement plantings (site GDC 72). This is the only known area of indigenous forest on the alluvial plain landform in Gore District. The forest is currently at an early successional phase (Wildland Consultants 2005).
- Small forest remnants in gullies to the east of Mataura River, including one QEII covenant (sites GDC 71 and QEII 5/13/109).

Tahakopa Ecological District

- Small indigenous forest remnants in gullies and on hillslopes (sites GDC 69 and GDC 70).
- Red tussock on hillslopes near Waiarikiki (part of site GDC 53).

Umbrella Ecological District

- Silver beech forest remnants and grey scrub in gullies on the foothills of the Black Umbrella Range in the north of Gore District (sites GDC 95-GDC 98, GDC 99, GDC 100, and GDC 102-GDC 104).
- Fernland on northeast-facing hillslopes on the foothills of the Black Umbrella Range (site GDC 101).
- Small red tussock wetland remnants (sites GDC 99 and QEII 5/13/203).

Waipahi Ecological District

- Indigenous forest and scrub predominantly on south-facing hillslopes. In the northwest of Waipahi ED, forest and scrub remnants are located on south-facing slopes of ridges of the Southland Syncline (e.g. sites GDC 83, GDC 85, and GDC 113). In the south of the ED, steep hillslopes above Mimihau Stream North Branch and Waiarikiki Stream contain the largest remnants (e.g. sites GDC 39, GDC 49, and GDC 59).
- Tall tussock grasslands on moderate hillslopes within farmland. Large unprotected remnants are present near the Mimihau Stream (part of site GDC 53 and site GDC 54) and south of Pukerau (GDC 91).
- Red tussock/wire rush bogs on flat land mostly in the east of Gore District (e.g. sites GDC 2 and GDC 3, and GDC 87-GDC 89).
- Swamp on Waiarikiki Stream that contains poorly represented flaxland (site GDC 5).

9. THREATS TO ECOLOGICAL VALUES

9.1 Wetlands

The threats and management issues relating to wetlands in Southland Plains Ecological District identified by Campbell *et al*. (2003) are equally applicable to those in Gore District:

- ***Drainage*:** Resulting in lowered water tables, peat degradation, and weed infestation (Figure 4).

- ***Weed invasion*:** Usually as a result of lowered water tables. Weeds such as gorse can alter nutrient levels by fixing nitrogen (Figure 4).

- ***Nutrient enrichment*:** From intensive land use practices upstream of wetlands, fertiliser drift, drainage and oxidation cause peat to degrade and release nutrients that were unavailable under the formerly anaerobic conditions, and nitrogen fixing from weeds.

- ***Hard edges*:** The abrupt transition from farmland to wetland affects drainage and there is a loss of natural buffer zones and complete vegetation sequences (Figure 4).

- ***Wetland size*:** Most wetlands are small remnants of much larger wetlands. Small wetlands have a greater edge to core ratio making them susceptible to weed invasion, water table lowering, and fertiliser drift.
- ***Land use change*:** The drainage and modification of wetland soils for agriculture.
- ***Fire*:** Fire risk may be increased through drying out as a result of drainage.
- ***Grazing*:** Stock cause pugging and compacting of the substrate, eat foliage and shoots, and add nutrients and seeds of introduced species through their excrement or urine.
- ***Reduction*:** All wetland types are poorly represented in Gore District compared to their former extent. Because they are rare and under threat, Campbell *et al*. (2003) believe that most remaining examples of all wetlands types should be protected.
- ***Lack of knowledge*:** Landowners and communities are less likely to value wetlands when they have little knowledge of their natural values. There is poor knowledge of what Southland's wetlands were once like, of the risks faced by wetlands, and of the hydrological functioning of various types of wetlands.

9.2 Other habitats

9.2.1 Grazing/stock

Many remnants of indigenous vegetation are unfenced and grazed by stock. Stock cause pugging and compaction of the soil, browse vegetation, disperse weeds, and add nutrients through their excrement and urine.

Figure 4: Wetland near Scott Road (Site GDC 8) showing drainage ditches, gorse invasion, and 'hard edges' on boundaries with pasture. [Google Earth image].

9.2.2 Weeds

Many weeds have the potential to displace indigenous species, thereby decreasing ecological values. Weed species typical of waterways and ponds include crack willow, gorse, and broom. Weeds in bogs such as the Pukerau Red Tussock Reserve include gorse, broom, blackberry (*Rubus fruticosus* agg.), and silver birch. Weeds in forest sites such as Croydon Bush include elder (*Sambucus nigra*), sycamore (*Acer pseudoplatanus*), tutsan (*Hypericum androsaemum*), hawthorn (*Crataegus monogyna*), gorse, red currant (*Ribes rubrum*), Chilean flame creeper (*Tropaeolum speciosum*), and Darwin's barberry (*Berberis darwinii*) (DOC Bioweb weeds database, accessed June 2011). Radiata pine (*Pinus radiata*), gooseberry (*Ribes glossularia*), and crack willow are also present at Croydon Bush (Ernest New and Associates 1992).

9.2.3 Pest animals

Pest mammals that are present or likely to be present in Gore District include red deer (*Cervus elaphus scoticus*) and pig (*Sus scrofa*) (DOC 1998), European rabbit (*Oryctolagus cuniculus cuniculus*), brown hare (*Lepus europaeus occidentalis*), European hedgehog (*Erinaceus europeaeus occidentalis*), mustelids (*Mustela* spp.), goat (*Capra hircus*), rats (*Rattus* spp.), brushtail possum (*Trichosurus vulpecula*), house mouse (*Mus musculus*), and feral cat (*Felis catus*). Pest birds recorded in Gore District include Australian magpie (*Gymnorhina tibicen*) and rook (*Corvus frugilegus*).

Possums are a major threat to indigenous biodiversity due to their widespread consumption of foliage, fruit, and vulnerable indigenous fauna. Deer are major browsers of palatable forest plants and can cause regeneration failure of palatable species such as broadleaf (*Griselinia littoralis*) and three-finger (*Pseudopanax colensoi*) over extensive areas of forest. As a consequence, areas of forest experiencing significant deer browse damage for long periods are likely to undergo fundamental shifts in composition. These compositional shifts will have adverse effects on indigenous fauna where deer eliminate plants that are important food sources for indigenous species. Mustelids and rodents are also major threats to indigenous biodiversity because of their predation of indigenous fauna (including birds, lizards, and invertebrates) and consumption of fruits and seeds of indigenous plants (Wildland Consultants 2008). Exotic fish species likely to be preying on indigenous fish and invertebrate species include brown trout, perch, and Chinook salmon.

Goat control occurs periodically in the Croydon Bush Scenic Reserve (DOC 1998). The Hokonui Tramping Club maintains DOC 200 traps in the same area for the control of mustelids. Hedgehogs and rodents are also caught (Southland Ecological Restoration Network 2010). The Hokonui Hills are a key area for Animal Health Board possum control operations. Principal aims are to keep possum numbers low and at even densities and to survey for Tb vectors (possums, ferrets, and feral pigs). An aerial 1080 bait control operation is likely before 2013 (Animal Health Board 2009). Some hunting is carried out on private land in the Hokonui Hills.

9.2.4 Land use change and intensification

Land use change and intensification, such as increases in dairy farming, can result in clearance of indigenous vegetation, degradation of water quality, and increases in levels of water extraction. The effects of farming activities are likely to vary with location and topography. For example, indigenous grassland and scrub on the Hokonui Hills are likely to be more greatly affected by stock than highly modified lowland habitats with few indigenous habitats remaining.

Residential development and urban sprawl is occurring around Gore, although its effect on indigenous biodiversity is unknown. Potential effects include vegetation clearance, hydrological modification, disturbance of wildlife, and/or introduction of weeds and domestic pets (Wildland Consultants 2008).

Southland supports many large industries in greenfield sites or previously undeveloped land, including those involved in wood processing, meat processing, fertiliser manufacturer, dairying, and aluminium smelting. In general, industries such as these are sited in highly modified sites, but they can affect biodiversity values in surrounding areas by discharges to air and water and via landfills. However, some of the existing industrial activities in Southland have provided significant benefits to local biodiversity through extensive planting of indigenous trees (e.g. the Dongwha MDF plant near Mataura), and restricting public vehicle access to sensitive areas (e.g. the NZAS aluminium smelter at Tiwai Point) (Wildland Consultants 2008).

Exotic plantation forestry activities are generally concentrated on land that is marginal for farming. These areas often support stands of indigenous tussock grassland and shrubland vegetation that are vulnerable to conversion to forestry use (Wildland Consultants 2008).

Due to extensive lignite deposits within Gore District, extractive industries pose a risk to indigenous biodiversity. Existing coal pits in Gore District are currently relatively small scale. Effects on indigenous values from these small pits are likely to be low and perhaps restricted to aquatic effects and loss of riparian red tussock and shrubs. Large scale lignite mining has the potential to have far greater potential adverse effects on water quality and loss of indigenous vegetation and habitats. For example, the only records of inanga in Gore District are from an area overlying the major lignite deposits. Some lignite deposits are also located on Acutely Threatened land environments in lowland areas between Gore and Mataura. However, mining also has the potential to create pond/lake habitats which can increase in ecological value over time.

Wind farm developments have the potential for adverse effects on indigenous biodiversity, such as vegetation clearance and disturbance, birds killed after striking turbine rotors, bird displacement, weed dispersal, lowered aquatic values, and increased accessibility resulting in farming intensification.

If conditions requiring ecological restoration and/or enhancement were attached to land use consents for activities such as those described above, many of them might result in indigenous biodiversity gains rather than losses.

9.2.5 Lack of Information

Biodiversity surveys have not been undertaken for most of Gore District. Few Environment Southland 'high value areas' (HVA) surveys on private land have been undertaken. Protected Natural Areas Programme (PNAP) surveys have been undertaken in Umbrella ED and Southland Plains ED. Although these ecological districts only comprise a small part of Gore District, they will still require inventory surveys for RMA Section 6(c) purposes, as the objective of PNAP surveys is to protect the best of what (vegetation/landform) remains, whereas under the RMA the primary objective is sustainable management, which has a very broad context. Field surveys will allow the state of biodiversity within Gore District to be assessed, determine whether changes are occurring over time, and identify the best management practices required to sustain biodiversity against current and future threats.

10. ECOLOGICAL CONSTRAINTS TO DEVELOPMENT

Areas with Outstanding Ecological Values

Many of the areas with outstanding ecological values are subject to some form of protection (e.g. the seven QEII covenants (sites 5/13/082, 5/13/107, 5/13/108, 5/13/109, 5/13/203, 5/13/235, and 5/13/263), the Mataura River (site GDC 100), Croydon Bush (site F450009), and Pukerau Red Tussock Reserve (site F450058)). The latter three are the only significant sites described in the Gore District Plan. Unprotected habitats on the Waterfall Range may also have outsatanding ecological values, either in their own right or through buffering of protected areas. Any development that adversely affects on areas with outstanding ecological values is undesirable.

Areas with High Ecological Values

Areas that contain high ecological values include wetlands, especially remaining red tussock fens, marshes, and swamps. Remaining areas of indigenous forest also have high ecological value because they are greatly reduced from their former extent. Waterways and their margins may also be high value habitats, if they provide habitat for important aquatic species such as inanga (Waimumu Stream) and Gollum galaxias (streams north of Gore township), support wetlands, or act as a important corridor or link between habitats. Any development occurring in areas with high ecological values requires detailed assessment of potential effects and the significance of values. Where development is approved, regard should be given to mitigation/biodiversity offsetting.

Constraints within areas with lignite deposits

Lignite deposits are largely located west of the Mataura River, where there tends to be fewer potentially significant sites located. Areas of ecological significance in these areas will be generally restricted to waterways and small associated wetlands. With careful location of other large developments it may be possible to avoid many adverse effects on existing ecological values.

11. POLICY FRAMEWORK

11.1 The New Zealand Biodiversity Strategy

Goal three of the New Zealand Biodiversity Strategy (DOC and MfE 2000) was developed in response to the evident decline of New Zealand's indigenous biodiversity:

"Maintain and restore the full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats and sustain the more modified ecosystems in production and urban environments; and do what is necessary to maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity."

The New Zealand Biodiversity Strategy goes on to say that the latter can be achieved by maintaining a full range of natural habitats and ecosystems.

11.2 National Priorities for the Protection of Biodiversity on Private Land

The Statement of National Priorities for the protection of biodiversity on private land (MfE and DOC 2007a; 2007b) directs biodiversity initiatives to areas and environments where historic biodiversity loss has been greatest, and where the remaining ecosystems, habitats, and species are most vulnerable to further loss. The National Priorities provide essential guidelines for Regional and District Council protection and restoration activities that contribute directly to the national biodiversity goals in the New Zealand Biodiversity Strategy. Projects aligned with the national priorities will have a greater probability of receiving funding from national sources such as the Biodiversity Condition and Advice Funds. The National Priorities provide a clear framework for reporting on progress towards maintenance of biodiversity at a regional level, and the national priorities assist with identification of significant indigenous vegetation within the context of Section 6(c) of the Resource Management Act (1991). The national priorities are set out below:

National Priority 1: To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20% or less remaining in indigenous cover.

Much of lowland Gore District is classified as Acutely Threatened (<10% indigenous cover remaining), with Chronically Threatened (10-20 % indigenous cover left) Land Environments present along waterways just to the north of Gore township, in the south-eastern quadrant of the district, and in the far southwest of the district.

National Priority 2: To protect indigenous vegetation associated with sand dunes and wetlands; ecosystems that have become uncommon due to human activity.

Wetlands once covered a large proportion of lowland areas in Gore District, but have become much reduced. Continuing threats include drainage, weeds, grazing, and conversion to forestry.

National Priority 3: To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by Priorities 1 and 2.

In Gore District, these include braided rivers[4] and cushion bogs. Williams *et al*. (2007) provide an extended conservation rationale for the classification and types of systems, with definitions.

National Priority 4: To protect habitats of acutely and chronically threatened indigenous species.

A wide range of acutely and chronically threatened[5] species occur in Gore District, including plants, birds, lizards, fish, and invertebrates.

11.3 Proposed National Policy Statement on Indigenous Biodiversity

This proposed national policy statement sets out the objective and policies to manage natural and physical resources on privately-owned land in order to maintain indigenous biological diversity. The policies proposed are summarised below:

Policy 1 provides a definition of significant indigenous vegetation or a significant habitat of indigenous fauna: "an area or habitat whose protection is important for the maintenance of indigenous biological diversity".

Policy 2 is equivalent to the National Priorities for the protection of biodiversity on private land (section 11.2 above).

Policy 3 requires that any regional policy statement notified after the date on which this national policy statement takes effect, shall include criteria for the identification of areas of significant vegetation and significant habitat of indigenous fauna.

Policy 4 states that district plans and any relevant regional plans shall identify, areas of significant indigenous vegetation and significant habitats of indigenous fauna, and include significance criteria that are consistent with those of the relevant regional policy statement.

Policy 5 states that local authorities must manage the effects of activities through district and relevant regional plans to ensure 'no net loss' of biodiversity of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

Policy 6 seeks maintenance of biodiversity outside of identified areas of significant indigenous vegetation and significant habitats of indigenous fauna, and the resilience and viability of populations and species assemblages within identified areas and habitats.

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[4] Like the Oreti River and Aparima River, the Mataura River is considered partially- or semi-braided (Environment Southland undated, Invercargill City Council undated).

[5] The more recent Proposed National Policy Statement on Indigenous Biodiversity replaces 'Acutely threatened' and 'Chronically threatened' with 'Threatened' and 'At Risk' from the updated national threat classification system (Townsend *et al*. 2008).

Policy 7 recognises and provides for the role of tangata whenua as kaitiaki in the development and implementation of regional policy statements and regional and district plans.

Policy 8 is concerned with consultation with affected parties.

The proposed NPS also contains a number of definitions that are relevant to the identification and assessment of indigenous biodiversity.

11.4 Resource Management Amendment Act 1991

As a matter of national importance the RMA requires:

Section 6(a):

> *The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.*

Section 6(c):

> *The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

11.5 Transitional Southland Regional Plan

The Southland Regional Plan (Southland Regional Council 1991) has rules relating to the use of beds of rivers and lakes, discharges to water, and the use, damming, and diversion of water, with detrimental effects on fisheries and wildlife habitats to be avoided.

11.6 Regional Water Plan for Southland

The Regional Water Plan for Southland (Environment Southland 2010c) contains rules for the taking, use, damming, diversion of water and the discharge of contaminants into water, the maintenance of water quality, aims to protect the natural character and outstanding natural features of lakes, rivers and wetlands, and to avoid, remedy or mitigate the adverse effects of activities in, on, under, over or adjacent to the beds of lakes, rivers and wetlands.

There are specific rules and policies relating to wetlands, with rules pertaining to the grazing of stock, diversion of water from wetlands, discharges to wetlands, and drainage of wetlands. However, the emphasis is on regionally significant wetlands, none of which have been identified in Gore District. Non-regulatory activities for wetlands include encouraging the establishment and maintenance of riparian margins to reduce non-point source discharges into wetlands, promoting and facilitating the use of Best Management Practices (BMPs) to prevent or reduce sediment inputs into wetlands, and investigating and promoting the development and introduction of a

combined regional and district plan to provide for the integrated management of wetlands.

Wetland Policies are Policy 38 (Avoid, remedy or mitigate the adverse effects of activities on wetlands through an integrated management approach with the Southland territorial authorities), Policy 39 (Use non-regulatory methods to promote best management practice in relation to retaining or enhancing the natural values of wetlands), and Policy 40 (Encourage the maintenance and restoration of existing wetlands and the creation of new wetlands).

11.7 Southland Regional Policy Statement (RPS)

The Southland RPS was adopted in November 1997. Section 5.2 of the RPS contains issues, objectives, policies, methods and implantation, outcomes, monitoring, and roles relating to biodiversity. Sections 5.4-5.6 cover issues relating to water quantity, water quality, and lakes, rivers, and wetlands. Wildland Consultants (2008) reviewed biodiversity issues as part of the current review of the Southland RPS (copy attached).

11.8 Specific comments on the Gore District Plan

In Section 2.3.1 of the Gore District Plan (Gore District Council 2006), remaining indigenous habitats are considered to be important because of their rarity within the district. The Waterfall Range, including the Croydon Bush, and Pukerau Red Tussock Reserve are the only two sites identified as significant within the District under Section 6(c) of the RMA. Other areas of indigenous vegetation and habitats of indigenous fauna within the District are not considered sustainable or warranting protection under Section 6(c) due to their small size and location. However, there are several bogs of equal size or larger than those at Pukerau within Gore District (e.g. sites GDC 3 on Slopoedown School Road and site GDC 7 on Scott Road), sustainability is not an ecological criterion, and the location of sites is only one factor in ranking their importance.

Objective 2.3.3 "To protect areas of significant indigenous vegetation and significant habitats of indigenous fauna and to manage the adverse effects of land use activities" relies on regulatory activities to protect the 2-3 identified significant sites and non-regulatory activities for the remainder. This is likely to be insufficient to adequately protect biodiversity within Gore District given that survey and assessment of potentially significant sites has not been undertaken and there are no significance criteria in the District Plan or Regional Plan to assess the sites against. Non-surveyed sites may also contain important biodiversity which is unlikely to be protected in the long-term by non-regulatory methods. This should be addressed at either a district or regional level.

Section 2.4 of the plan states that there are no natural lakes and no wetlands other than those on Crown land in Gore District. However, there are many natural wetlands within the District that are on private land. If the Gore District Plan is reviewed, it would be appropriate to adopt the definition of wetlands from the RMA, as does Regional Water Plan for Southland (Environment Southland 2010c):

Wetland: Includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions

Environment Southland's Wetland Drainage and Vegetation Clearance Rules provide examples of wetlands:

- Wetlands that are part of river, stream and lake beds;
- Natural ponds, swamps, marshes, fens, bogs, seeps, brackish areas, mountain wetlands, and other naturally wet areas that support a indigenous ecosystem of plants and animals specifically adapted to living in wet conditions;
- Coastal wetlands above mean high water springs.
- Gullies with red tussock, flaxes, and sedges, wetlands with existing drains and exotic species, oxbow lakes, and peatlands and peat bogs.

The Gore District Plan indicates that the species of most significance in waterways are brown trout and eel. However, waterways and their margins provide habitat for several other threatened or uncommon indigenous species. These include Gollum galaxias, koura, inanga, and probably torrentfish and lamprey. Black-billed gull regularly utilise sites along the Mataura River.

In summary, the Gore District Plan contains a set of rules for protection of significant indigenous vegetation and habitats (Rule 2.3.9), but identifies only a very few significant sites and does not contain any ecological significance criteria to assess the importance of indigenous vegetation and habitats. Protection for wetlands within the Gore District Plan appears to be particularly lacking and is reliant on Environment Southland policy and rules. The focus of the Plan is to protect existing values rather than to improve biodiversity values within the district, but enhancement of biodiversity is a worthy goal in a district that has been so extensively modified. In addition, protection of existing values is reliant on non-regulatory methods which may not be sufficient given the continuing threats to indigenous vegetation and habitats.

12. ECOLOGICAL SIGNIFICANCE CRITERIA

For the assessment of potentially significant sites in Gore District, the following criteria and definitions could be used to assess whether a site is significant with respect to Section 6(c) of the Resource Management Act (RMA). These criteria have a strictly ecological basis; for example they do not address the cultural or amenity values which are referred to in other sections of the Act. They do, however, incorporate the National Priorities (refer to Section 9). Significance is assessed at an ecological district scale. For every site, each criterion should be given a ranking of either high, moderate, or low. A site could be deemed to be significant if it meets a number and level of criteria, such as:

- One or more high (H) values;
- Two or more moderate (M) values.

A site may also be determined to be nationally, regionally, or locally significant depending on the number and levels of criteria met. It should be noted that rankings

for each criterion may be adjusted once a fuller picture of ecological features and values in Gore District is known. For example, if a particular vegetation type is found to be much rarer than originally thought, then sites with this type may have a higher level of significance.

A suggested criteria set is provided below, based on the suggested Southland RPS criteria set (Wildland Consultants 2008).

Representativeness. Whether the site includes a stand of vegetation that is a good example, or if all examples are modified, one of the only remaining examples, of the typical vegetation of its ecological district. 'Typical' refers to vegetation types probably occurring in New Zealand at an arbitrary baseline (pre-1840 or pre-human are commonly used) and is accepted as being closest to the original condition. The assessment of representativeness necessarily incorporates information on the quality (e.g. structure and composition) of the vegetation, and comparison with the quality of stands of the same (or similar) vegetation type that occur elsewhere in the ecological district.

Indigenous cover on LENZ environments. Whether the site includes indigenous vegetation on Level IV land environments which have less than 20% indigenous cover remaining.

Wetlands and sand dunes. Whether the site includes wetland or sand dune habitats, and the extent that these are covered by indigenous vegetation.

Wetlands are a National Priority for protection (Section 11.2 of this report) and are much reduced from their former extent within Southland (*c.*10% remaining). Bogs are relatively well represented, but fens (13% remaining), marshes (4%) and swamps (1%) are poorly represented (Clarkson *et al*. 2011). Due to the extensive loss of wetlands in Southland, virtually all remaining wetlands are likely to be significant (Clarkson *et al*. 2011).

Rarity. Whether a site provides habitat for a species, vegetation type, or ecosystem that is threatened or uncommon at national, regional, or local scales. For this criterion, the national scale should include reference to the most recent national classification of threatened and uncommon species:

- Allibone *et al*. (2010): freshwater fish;
- de Lange *et al* (2009): vascular plants;
- Hitchmough *et al* (2009): reptiles.
- Miskelly *et al* (2008): birds;
- O'Donnell *et al*. (2010): bats;
- Hitchmough *et al.* (2007): freshwater and terrestrial invertebrates, bryophytes, fungi, and macroalgae.

The first five references use the most recent classification system of Townsend *et al*. (2008), while Hitchmough *et al.* (2007) uses an older system. Updated lists should be used as they become available.

Nationally rare ecosystems should include those that are classified as 'originally rare' on a national scale (Williams *et al*. 2007).

Regional rarity should be assessed at the scale of the ecological region, and local rarity at the scale of the ecological district (as defined by McEwen 1987).

Distinctiveness/Special Features. Whether the site includes any distinctive or unusual features such as species distribution limits, intact ecological sequences, type localities, intact ecological functions, or any other special ecological features not covered by other criteria.

Diversity and Pattern. Whether the site contains a high diversity of species, habitats, ecosystems and/or landforms, or exhibits complex patterning of ecological features. When comparing species richness between sites, it is important to compare 'apples with apples', because different ecosystems can have intrinsic differences in species richness.

Naturalness/Intactness: Whether the site contains vegetation and habitat types that are less affected by pests, weeds, or other modifications, relative to similar vegetation and habitat types elsewhere in the ecological district.

Ecological Context: The relationship between the site and its surroundings. For example, whether the site has an important role in ecological processes such as dispersal and migration and buffering of adjacent indigenous vegetation or ecosystems, or has hydrological functions. Examples in Gore District include Site GDC 75 (buffering Croydon Bush Scenic Reserve) and Mataura River (migration of diadromous fish species).

Fauna Habitat: Whether the site is an important feeding, breeding, roosting, nesting, resting, and/or otherwise important site for indigenous fauna, whether on a temporary, seasonal, or permanent basis.

13. OPPORTUNITIES TO PROTECT AND IMPROVE ECOLOGICAL VALUES

Policy 6 of the Proposed National Policy Statement on Indigenous Biodiversity (MfE 2011) outlines several methods for the protection and enhancement of indigenous biodiversity and these would be appropriate for Gore District:

- Retention of existing vegetation that provides habitat for indigenous species, seasonal food sources for indigenous species, ecological linkages between areas and habitats, or a buffer to indigenous vegetation (e.g. kowhai treeland on riparian margins).
- Mitigate and offset adverse effects on indigenous species when vegetation and habitat cannot be retained.

- Planting of naturally occurring, locally sourced indigenous species and the creation of habitats for indigenous species (e.g. indigenous plantings associated with the Dongwha Patinna MDF plant).

- Plant pest and animal pest control.

- Establishment of additional indigenous riparian vegetation as a means of increasing connectivity and enhancing freshwater habitat for indigenous species

- Prevent human-made structures adversely affecting indigenous species by interfering with their natural migratory movements.

- Using both regulatory incentives (such as bonus development rights in exchange for protection and enhancement of vegetation and habitats) and non regulatory incentives, (such as technical advice and practical help) to support and encourage landowners to make appropriate land management decisions.

A good summary of regulatory and non-regulatory activities that can be used to protect ecological values is provided in Wildland Consultants (2008). The following sections comprise a brief description of activities that would improve ecological values in Gore District based on identified threats.

13.1 Ecological linkages and buffers

Remaining areas of indigenous vegetation within Gore District are generally isolated from neighbouring remnants and from more extensively forested areas. Restoration of indigenous vegetation between remnants will not only increase the area of habitat available, but help promote connectivity for indigenous plants and fauna, maintaining species dispersal and gene flow, and therefore the long-term viability of remnants and their biota. Identifying potential indigenous corridors and linkages in plans would allow individual initiatives to add to landscape-level biodiversity goals.

The margins of waterways provide excellent potential for linking terrestrial habitats, while also improving the quality of aquatic habitats, reducing flooding impacts, and protecting water quality and soil from erosion. Fencing and planting of riparian margins with ecologically appropriate indigenous species is promoted by Environment Southland.

Many indigenous habitats in Gore District are poorly buffered (e.g. raised peat bogs) or the buffers are unprotected (e.g. indigenous habitats contiguous with Croydon Bush Scenic Reserve). Protecting existing buffers and establishing buffers at other sites would help to protect existing habitats.

13.2 Fencing

Fencing of indigenous remnants will generally be of great ecological benefit, as it prevents browsing, trampling, pugging, tracking, weed dispersal, and nutrient enhancement by stock. Buffers and linkages should also be fenced from stock.

13.3 Legal protection

Only *c.*6% of Gore District is covered in indigenous vegetation (LCDB2; Appendix 1) and only *c.*13% of that is protected (a total of 0.8% of Gore District is covered in protected indigenous vegetation). Ranking of significant sites will assist the setting of priorities for restoration and/or protection of indigenous habitats within Gore District (see Section 14.1). Forms of legal protection include conservation covenants or management agreements with DOC, Queen Elizabeth II National Trust, or GDC.

13.4 Control of pest plants and animals

Pest plant and animal control should be continued and expanded to additional sites. In some high value sites, control of all major pest animals should be considered due to the widespread biodiversity benefits this provides. Pest animal and weed control is likely to be funded and carried out by landowners but incentives could be provided by local or regional government (see following section). If sufficient funding could be raised, there may be opportunities for pest-proof fencing to exclude all mammalian pest animals from an important site (e.g Croydon Bush). This would potentially provide a secure breeding site from which dispersal of mobile indigenous fauna to surrounding habitats could occur.

13.5 Sources of funding

Many landholders will be keen to protect indigenous biodiversity on their land, and the Council can provide such things as advice, fencing subsidies, and other funding, and rates relief, or help with acquisition by public bodies. Further funding opportunities such as the Biodiversity Advice and Condition Funds (DOC and MfE), Community Conservation Fund, Nature Heritage Fund, Nga Whenua Rahui, QEII National Trust, Lottery Grants Board, Honda Tree Fund, and NZ Landcare Trust could be promoted by Council.

14. INITIAL BIODIVERSITY PRIORITIES

14.1 Field survey and significance assessments of potentially significant sites

Inventory surveys have not been undertaken in Gore ED and Waipahi ED, and protected natural areas comprise less than 20% of the land area in these districts, making these EDs high priorities for biodiversity inventory surveys (Wildland Consultants 2004). Field survey of potentially significant sites will involve contact and liaison with landowners, field survey of sites including flora and fauna present, description and mapping of vegetation and habitats present, and identification of threats to indigenous values. Information gathered during field surveys should be used to assess the ecological significance of sites. Clearer identification of sites containing significant indigenous vegetation and significant habitats of indigenous fauna would help to clarify those activities which could require resource consent. Mapping of these areas for inclusion in the Gore District Plan along with more robust plan provisions would help to clarify the Council's approach towards indigenous vegetation issues. Priority areas for survey and assessment are Southland Plains ED

and Gore ED (threatened by extractive industry), followed by Waipahi ED (few protected sites).

14.2 Gore District Planning

It will be important to have an overarching biodiversity goal for Gore District. Goals should be tied to outcomes that can be definitely achieved, are readily observed and appreciated by the public, and can be easily measured to report on progress. The goals should set out how functioning and valued ecosystems can be incorporated into the landscapes where people live, work, and play. Regulation, incentives, and facilitation are important functions, but these will work best when the community is well informed and there is community support.

The Proposed National Policy Statement on Indigenous Biodiversity (MfE 2011), if gazetted, will require the identification of significant sites, the inclusion in the District Plan of a schedule of significant sites, significance criteria for assessment of surveyed and unsurveyed sites, and rules and policies relating to significant sites and other indigenous vegetation and habitats. These matters are addressed in most existing TLA plans.

15. CONCLUSIONS

This study has identified 169 potentially important ecological sites within Gore District that include the Mataura River and its margins, indigenous forest, scrub, and grasslands, oxbow lakes, farm ponds and old workings ponds, red tussock/wire rush bogs and other wetlands, and habitats of threatened and uncommon plants, reptiles, fish, and invertebrates. Many of these habitats are likely to be threatened by existing land uses, weeds, pest animals, and lack of knowledge and information.

The current policy framework for protection of indigenous biodiversity within Gore District could be strengthened by including a schedule of significant sites, ecological significance criteria, and general rules relating to indigenous vegetation and habitats (including wetlands) in the Gore District Plan. Rules should reflect objectives and policies outlined at a national (e.g. the National Policy Statement on Indigenous Biodiversity) and regional level.

There is great potential to improve ecological values within Gore District. A combination of regulatory and non regulatory incentives should be used to support and encourage landowners to make appropriate land management decisions. Adopting a biodiversity goal for the District that can be tied to easily measured and achievable outcomes will help direct policy on how functioning and valued ecosystems can be incorporated into the landscape.

Current priorities for the protection of biodiversity within Gore District are the field survey and ecological significance assessments of potentially significant indigenous habitats.

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LANDCOVER IN GORE DISTRICT

Ecological assessments are undertaken at the scale of the ecological district. Therefore these data are provided for each entire ecological district, even though only part of each ecological district is within Gore District.

Landcover Classification	Gore		Hokonui		Southland Plains		Tahakopa		Umbrella		Waipahi	
	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total
Afforestation (imaged, post LCDB 1)	72.3	0.0	188.2	0.3	78.9	0.0	1955.9	0.8	7.5	0.0	692.6	0.7
Afforestation (not imaged)	80.9	0.0	69.5	0.1	64.8	0.0	560.7	0.2	61.6	0.0	14.9	0.0
Alpine Gravel and Rock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.1	0.0	0.0	0.0
Broadleaved Indigenous Hardwoods	467.4	0.2	495.8	0.7	332.7	0.1	4734.3	2.0	48.4	0.0	677.1	0.7
Built-up Area	1173.8	0.4	7.7	0.0	3202.9	1.2	128.8	0.1	25.9	0.0	26.2	0.0
Coastal Sand and Gravel	0.0	0.0	0.0	0.0	29.7	0.0	663.9	0.3	0.0	0.0	0.0	0.0
Deciduous Hardwoods	2304.5	0.8	129.5	0.2	1061.5	0.4	104.6	0.0	178.5	0.1	55.5	0.1
Depleted Tussock Grassland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.6	0.1
Dump	2.5	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estuarine Open Water	0.0	0.0	0.0	0.0	145.4	0.1	461.7	0.2	0.0	0.0	0.0	0.0
Fernland	6.6	<0.1	0.0	0.0	3.1	<0.1	198.7	0.1	439.2	0.3	224.1	0.2
Flaxland	14.4	<0.1	0.0	0.0	93.9	0.0	104.4	0.0	0.0	0.0	8.0	0.0
Forest Harvested	1152.9	0.4	247.2	0.4	1116.1	0.4	1569.3	0.7	11.2	0.0	491.2	0.5
Gorse and Broom	2055.4	0.7	1295.0	1.9	925.4	0.4	2372.4	1.0	877.2	0.6	1387.5	1.5
Grey Scrub	469.0	0.2	1726.8	2.6	89.9	0.0	610.5	0.3	2096.4	1.4	1738.2	1.9
Herbaceous Freshwater Vegetation	317.5	0.1	63.8	0.1	2796.9	1.1	805.1	0.3	865.7	0.6	103.5	0.1
Herbaceous Saline Vegetation	0.0	0.0	0.0	0.0	58.1	0.0	146.7	0.1	0.0	0.0	0.0	0.0
High Producing Exotic Grassland	265702.6	89.4	29984.8	45.0	237153.2	89.0	130282.8	54.5	51497.5	34.9	72917.7	78.3
Indigenous Forest	1641.3	0.6	11645.7	17.5	4634.5	1.7	74796.8	31.3	12818.9	8.7	2103.9	2.3
Lake and Pond	83.5	0.0	5.9	0.0	210.1	0.1	97.1	0.0	8.0	0.0	15.5	0.0
Landslide	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	<0.1	0.0	0.0
Low Producing Grassland	2010.8	0.7	1670.5	2.5	2094.0	0.8	1682.5	0.7	44873.1	30.4	206.8	0.2
Major Shelterbelts	281.7	0.1	5.6	0.0	227.1	0.1	63.6	0.0	8.4	0.0	51.2	0.1
Manuka and or Kanuka	477.6	0.2	2915.5	4.4	92.4	0.0	4419.9	1.9	1384.5	0.9	334.1	0.4
Matagouri	327.7	0.1	0.0	0.0	0.0	0.0	8.3	<0.1	27.1	0.0	0.0	0.0
Mixed Exotic Shrubland	111.0	0.0	70.2	0.1	198.3	0.1	16.0	0.0	136.8	0.1	96.9	0.1
Orchard and Other Perennial Crops	8.8	<0.1	0.0	0.0	24.0	0.0	0.0	0.0	140.7	0.1	0.0	0.0
Other Exotic Forest	1471.0	0.5	1180.7	1.8	969.9	0.4	4221.1	1.8	779.3	0.5	595.3	0.6
Pine Forest - Closed Canopy	6235.8	2.1	1812.8	2.7	2900.6	1.1	3912.5	1.6	484.5	0.3	2929.8	3.2

Landcover Classification	Gore		Hokonui		Southland Plains		Tahakopa		Umbrella		Waipahi	
	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total
Pine Forest - Open Canopy	2543.7	0.9	1301.6	2.0	2158.6	0.8	3282.1	1.4	225.3	0.2	1760.4	1.9
River	1771.1	0.6	0.0	0.0	1237.7	0.5	76.6	0.0	236.9	0.2	28.1	0.0
River and Lakeshore Gravel and Rock	970.4	0.3	0.0	0.0	751.5	0.3	103.1	0.0	42.2	0.0	0.0	0.0
Short-rotation Cropland	3210.2	1.1	0.0	0.0	2612.3	1.0	3.9	<0.1	170.0	0.1	0.0	0.0
Sub Alpine Shrubland	0.0	0.0	1244.1	1.9	0.0	0.0	0.0	0.0	4.7	<0.1	0.0	0.0
Surface Mine	129.4	0.0	0.0	0.0	89.4	0.0	38.5	0.0	3.1	<0.1	0.8	<0.1
Tall Tussock Grassland	1613.8	0.5	10631.2	15.9	17.6	0.0	1591.6	0.7	30247.8	20.5	6586.0	7.1
Transport Infrastructure	0.0	0.0	0.0	0.0	4.9	<0.1	25.1	0.0	0.0	0.0	3.2	<0.1
Urban Parkland/ Open Space	476.1	0.2	16.2	0.0	1069.3	0.4	8.7	<0.1	17.6	0.0	16.5	0.0
Vineyard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	<0.1	0.0	0.0
Grand Total	**297183.6**	**100.0**	**66708.3**	**100.0**	**266444.9**	**100.0**	**239047.3**	**100.0**	**147765.3**	**100.0**	**93123.5**	**100.0**

COVER OF INDIGENOUS AND FRESHWATER WETLAND HABITATS IN GORE DISTRICT

Landcover Classification	Gore		Hokonui		Southland Plains		Tahakopa		Umbrella		Waipahi	
	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total	Area (ha)	% of Total
Forest	2108.6	0.7	12141.5	18.2	4967.1	1.9	79531.1	33.3	12867.3	8.7	2781.0	3.0
Scrub and shrubland	1274.3	0.4	5886.4	8.8	182.3	0.1	5038.8	2.1	3512.7	2.4	2072.3	2.2
Grassland	1613.8	0.5	10631.2	15.9	17.6	0.0	1591.6	0.7	30247.8	20.5	6644.6	7.1
Fernland	6.6	<0.1	0.0	0.0	3.1	<0.1	198.7	0.1	439.2	0.3	224.1	0.2
Flaxland	14.4	<0.1	0.0	0.0	93.9	0.0	104.4	0.0	0.0	0.0	8.0	0.0
Freshwater wetlands, lakes and ponds	401.0	0.1	69.7	0.1	3006.9	1.1	902.2	0.4	873.6	0.6	119.0	0.1
All Indigenous habitats[1]	8160.2	2.7	28728.9	43.1	10493.5	3.9	88818.7	37.2	48262.7	32.7	11877.0	12.8

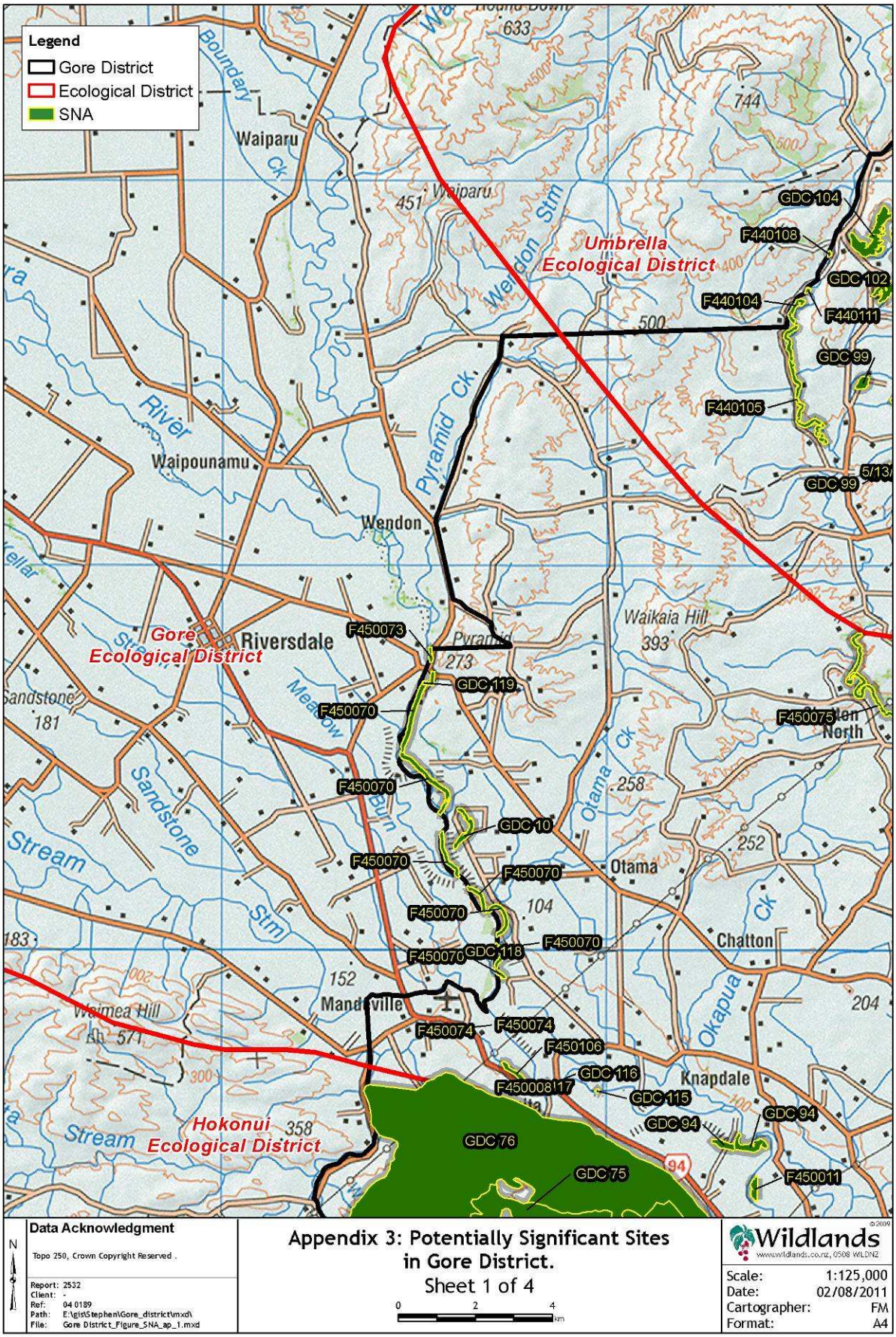
[1] Indigenous habitats in Gore District include Broadleaved Indigenous Hardwoods, Depleted Tussock Grassland, Estuarine Open Water, Fernland, Flaxland, Grey Scrub, Herbaceous Freshwater Vegetation, Indigenous Forest, Lake and Pond, Manuka and or Kanuka, Matagouri, River, River and Lakeshore Gravel and Rock, Sub Alpine Shrubland, and Tall Tussock Grassland. Some of these habitats may have an exotic component, but the total provides an estimate for indigenous habitats in the respective ecological district.

THREATENED LAND ENVIRONMENTS IN GORE DISTRICT

Threat Classification	Area (ha) (percent area)						
	Gore	**Hokonui**	**Southland Plains**	**Tahakopa**	**Umbrella**	**Waipahi**	**Total**
Acutely Threatened <10% indigenous vegetation cover remaining	58,796.1 (84.8)	493.2 (11.2)	2,067.2 (54.7)	1,677.7 (59.7)	5,008.4 (54.7)	22,039.7 (61.7)	**90,082.2 (72.0)**
Chronically Threatened 10-20% indigenous vegetation cover remaining	1,410.3 (2.0)	60.5 (1.4)	160.9 (4.3)	15.2 (0.5)	0 (0)	1,370.2 (3.8)	**3,017.1 (2.4)**
At Risk 20-30% indigenous vegetation cover remaining	4,136.6 (6.0)	759.1 (17.3)	1,287.2 (34.1)	0 (0)	2,660.9 (29.1)	10.7 (<0.1)	**8,854.6 (7.1)**
Critically Underprotected >30% left and <10% protected	71.4 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	**71.4 (0.1)**
Underprotected >30% left and 10-20% protected	486.7 (0.7)	2,273.2 (51.8)	0 (0)	0 (0)	21.3 (0.2)	15.7 (<0.1)	**2,797.0 (2.2)**
No Threat >30% left and >20% protected	3,347.7 (4.8)	803.4 (18.3)	174.7 (4.6)	1,114.8 (39.7)	1,461.0 (16.0)	12,207.2 (34.2)	**19,108.9 (15.3)**
Unclassified	1,054.7 (1.5)	0.2 (<0.1)	87.1 (2.3)	0.7 (<0.1)	2.7 (<0.1)	81.6 (0.2)	**1,227.0 (1.0)**
Total	**69,303.7**	**4,389.6**	**3,777.0**	**2,808.4**	**9,154.3**	**35,725.1**	**125,158**

APPENDIX 3

MAPS OF POTENTIALLY SIGNIFICANT SITES IN GORE DISTRICT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Ecological District
SNA
Umbrella Ecological District
Gore Ecological District
Hokonui Ecological District
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Waipounamu
Wendon
Waiparu
Otama
Chatton
Knapdale
Mandeville
Waikaia Hill
Waimea Hill
Pyramid Ck.
Weldon Stm
Sandstone Stream
Meadow Burn
Okapua Ck
Otama Ck
GDC 104
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GDC 102
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GDC 99
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Appendix 3: Potentially Significant Sites in Gore District.
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Cartographer: FM
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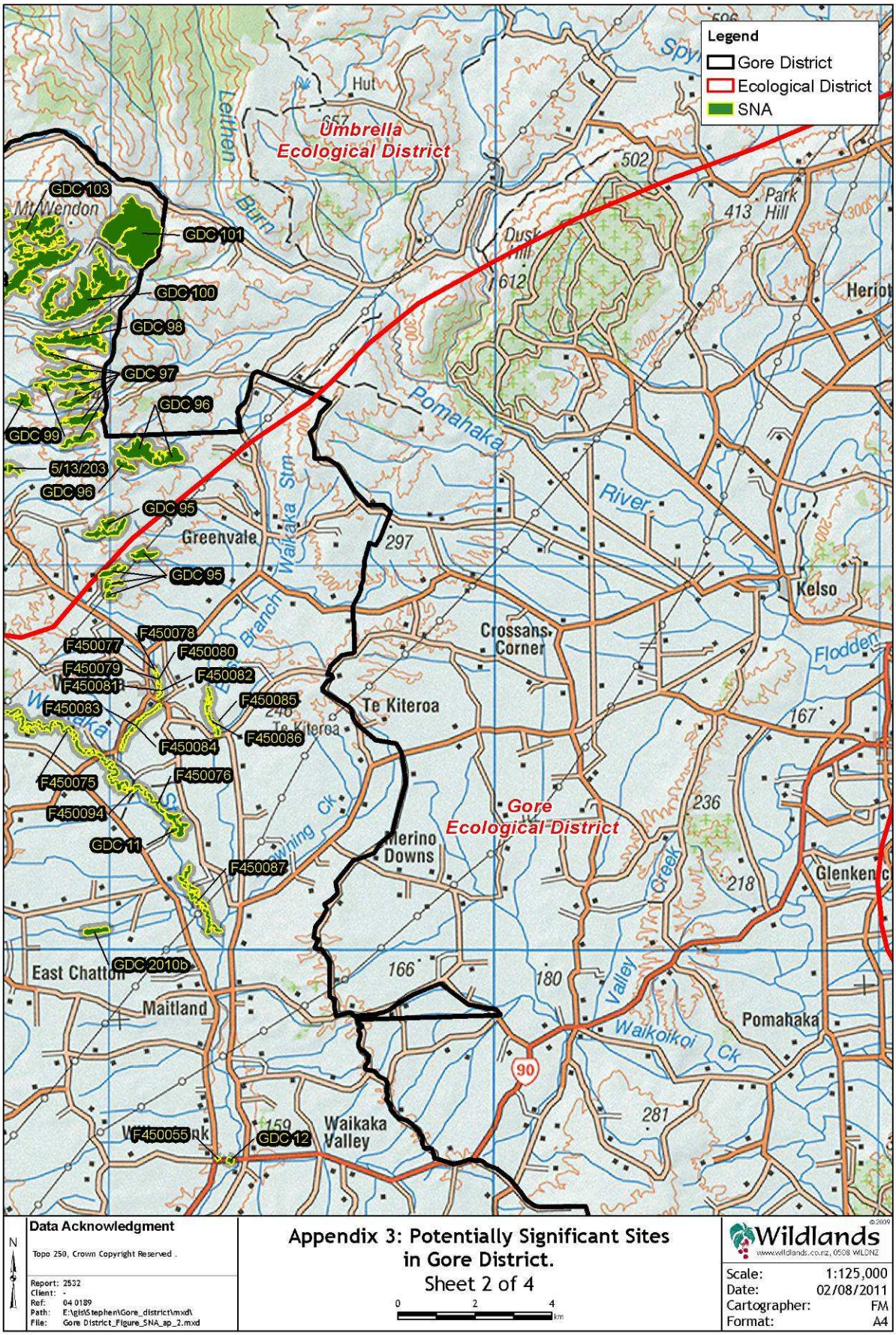

Data Acknowledgment

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Appendix 3: Potentially Significant Sites in Gore District.
Sheet 2 of 4

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www.wildlands.co.nz, 0508 WILDNZ

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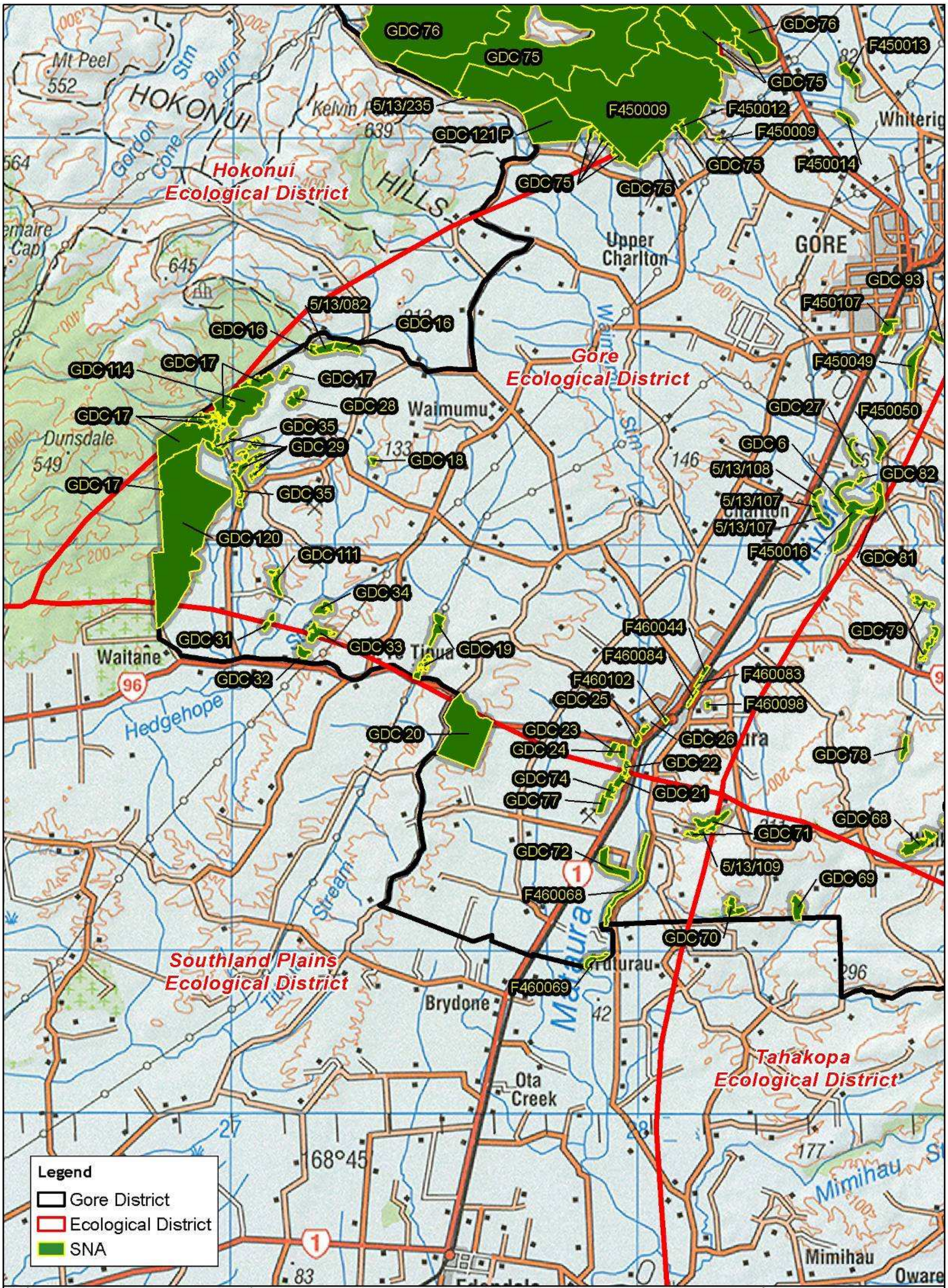

Data Acknowledgment

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Appendix 3: Potentially Significant Sites in Gore District.

Sheet 3 of 4

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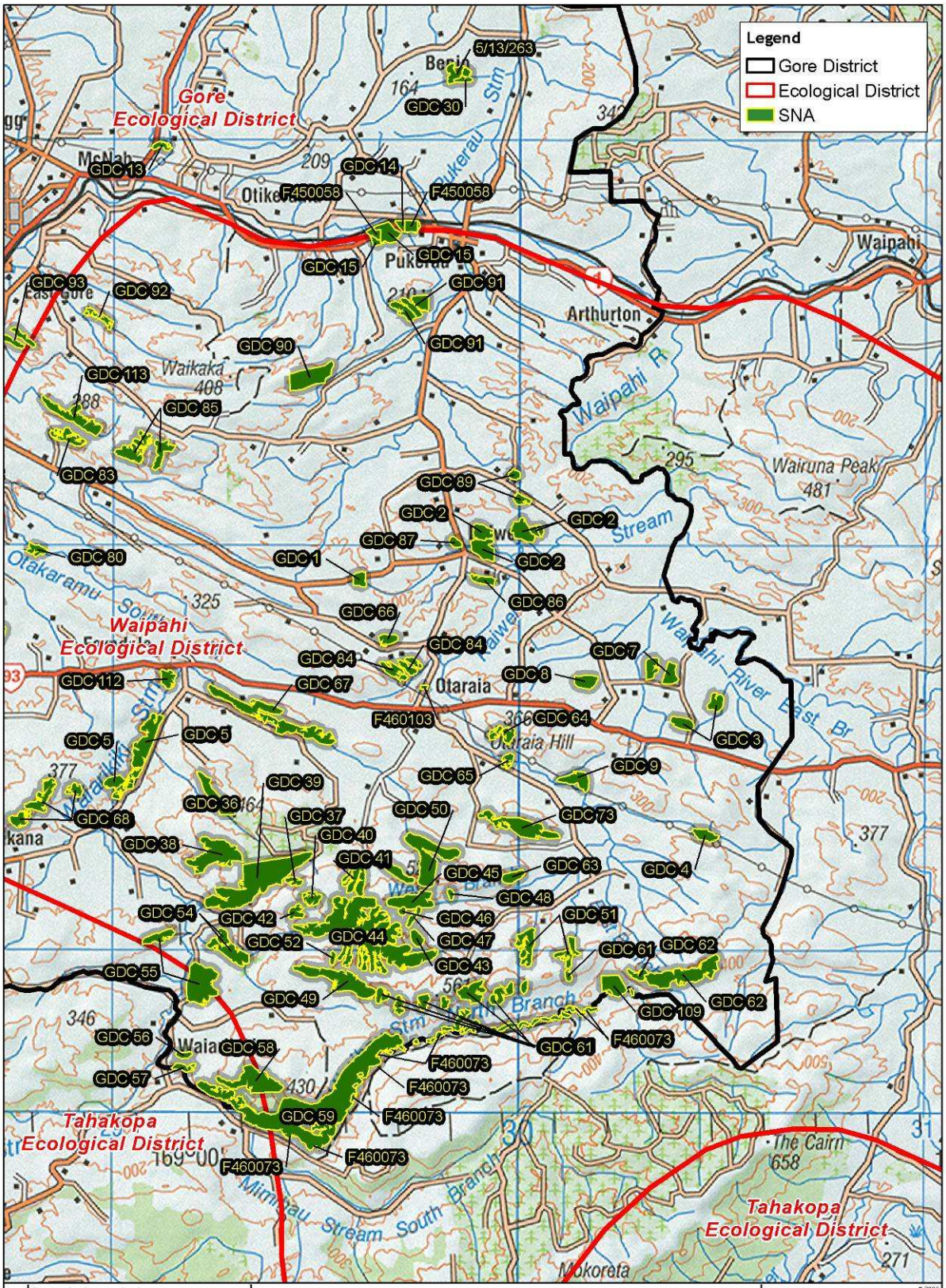
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Gore District
Ecological District
SNA
Gore Ecological District
Waipahi Ecological District
Tahakopa Ecological District
Tahakopa Ecological District
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Arthurton
Waipahi
Waipahi R
Waipahi River East Br
Wairuna Peak
Waikaka
Otakaramu
Mokoreta
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Appendix 3: Potentially Significant Sites in Gore District.
Sheet 4 of 4
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